Anritsu

MP1520B
PDH Analyzer
Operation Manual
Vol.1

Read this manual before using the equipment.
Keep this manual with the equipment.

MP1520B
PDH Analyzer
Operation Manual
Vol.1

(Panel Operating Instructions)

Fifth Edition

Read this manual before using the equipment.
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Measuring Instruments Division
Measurement Group

ANRITSU CORPORATION

Document No.: M-W0920AE-5.0

Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Insure that you clearly understand the meanings of the symbols BEFORE using the equipment.

Symbols used in manual

DANGER	This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.
WARNING	This indicates a hazardous procedure that could result in serious injury or death if not performed properly.
CAUTION	This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

Safety Symbols Used on Equipment and in Manual

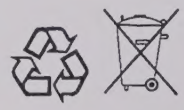
(Some or all of the following five symbols may not be used on all Anritsu equipment. In addition, there may be other labels attached to products which are not shown in the diagrams in this manual.)
The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Insure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.

This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.

This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.

This indicates warning or caution. The contents are indicated symbolically in or near the triangle.

This indicates a note. The contents are described in the box.



These indicate that the marked part should be recycled.

MP1520B PDH Analyzer Operation Manual Vol.1
(Panel Operating Instructions)

January 1995 (First Edition)
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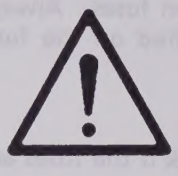
For Safety

WARNING



1. Always refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced.
   Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.

2. When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, before supplying power to the equipment, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.

Repair

WARNING ⚠

3. This equipment cannot be repaired by the user. DO NOT attempt to open the cabinet or to disassemble internal parts. Only Anritsu-trained service personnel or staff from your sales representative with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision parts.

Falling Over

4. This equipment should be used in the correct position. If the cabinet is turned on its side, etc., it will be unstable and may be damaged if it falls over as a result of receiving a slight mechanical shock.

For Safety

CAUTION

Changing Fuse

CAUTION ⚠

1. Before changing the fuses, ALWAYS remove the power cord from the poweroutlet and replace the blown fuses. Always use new fuses of the type and rating specified on the fuse marking on the rear panel of the cabinet.

   T□□□ A indicates a time-lag fuse.

   There is risk of receiving a fatal electric shock if the fuses are replaced with the power cord connected.

2. Keep the power supply and cooling fan free of dust.

   Cleaning

   - Clean the power inlet regularly. If dust accumulates around the power pins, there is a risk of fire.
   - Keep the cooling fan clean so that the ventilation holes are not obstructed. If the ventilation is obstructed, the cabinet may overheat and catch fire.

Equipment Certificate

Anritsu Corporation certifies that this equipment was tested before shipment using calibrated measuring instruments with direct traceability to public testing organizations recognized by national research laboratories including the Electrotechnical Laboratory, the National Research Laboratory and the Communication Research laboratory, and was found to meet the published specifications.

Anritsu Warranty

Anritsu Corporation will repair this equipment free-of-charge if a malfunction occurs within 1 year after shipment due to a manufacturing fault, provided that this warranty is rendered void under any or all of the following conditions.

- The fault is outside the scope of the warranty conditions described in the operation manual.
- The fault is due to misoperation, misuse, or unauthorized modification or repair of the equipment by the customer.
- The fault is due to severe usage clearly exceeding normal usage.
- The fault is due to improper or insufficient maintenance by the customer.
- The fault is due to natural disaster including fire, flooding and earthquake, etc.
- The fault is due to use of non-specified peripheral equipment, peripheral parts, consumables, etc.
- The fault is due to use of a non-specified power supply or in a non-specified installation location.

In addition, this warranty is valid only for the original equipment purchaser. It is not transferable if the equipment is resold.

Anritsu Corporation will not accept liability for equipment faults due to unforeseen and unusual circumstances, nor for faults due to mishandling by the customer.

Anritsu Corporation Contact

If this equipment develops a fault, contact the head office of Anritsu Corporation at the address in the operation manual, or your nearest sales or service office listed on the following pages.

MEMORY BACK-UP BATTERY REPLACEMENT

The power for memory back-up is supplied by a Poly-carbomonofluoride Lithium Battery. This battery should only be replaced by a battery of the same type; since replacement can only be made by Anritsu, contact the nearest Anritsu representative when replacement is required.

STORAGE MEDIUM

This equipment stores data and programs using backed - up memories . Data and programs may be lost due to improper use or failure.

ANRITSU CANNOT COMPENSATE FOR ANY MEMORY LOSS.

Please pay careful attention to the following points.

(Backed-up memory)

- Isolate the memory from static electricity.

Note: *The battery life is about 7 years. Early battery replacement is recommended.*

CONCERNING THE DISPOSAL OF AN MP1520B

This instrument employs LEDs which contain an arsenical compound. Should the MP1520B be discarded for any reason, an adequate care should be taken so that it is disposed of according to the waste disposal laws of your own country.

CE Marking

Anritsu affix the CE Conformity Marking on the following product(s) accordance with the Council Directive 93/68/EEC to indicate that they conform with the EMC directive of the European Union (EU).

CE Conformity Marking

CE

1. Product Name / Model Name

Product Name: PDH Analyzer and plug-in unit
Model Name: MP1520B

2. Applied Directive

EMC: Council Directive 89/336/EEC

3. Applied Standards

Electromagnetic radiation:

EN55011 (ISM, Group 1, Class A equipment)

Immunity:

EN50082-1

	Performance Criteria*
IEC801-2(ESD) 4 kVCD, 8 kVAD	B
IEC801-3 (Rad.) 3 V/m	A
IEC801-4 (EFT) 1 kV	B

*: Performance Criteria

A: No performance degradation or function loss

B: Self-recovered temporary degradation of performance or temporary loss of function

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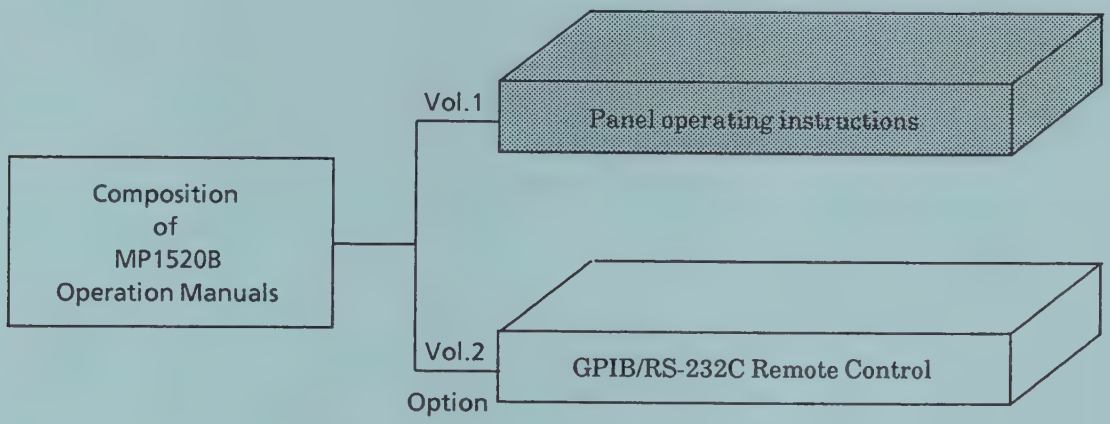
ABOUT THIS MANUAL

Composition of MP1520B Operation Manuals

The MP1520B PDH Analyzer Operation Manuals are composed of the following two documents. Use them properly according to the usage purpose.



Panel operating instructions: Provides an outline of the MP1520B, and describes preparation before use, manual operation (local operation: panel description, basic operating instructions, detailed operating instructions), measurement examples, performance tests, and storage and transportation.

GPIB/RS-232C Remote Control: Describes the remote control and program examples used for GPIB and RS-232C interfaces. This manual is supplied with the GPIB or RS-232C interface unit sold separately as Option 04 or Option 05.

(The MP1520B complies with SCPI.)

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SECTION 1
GENERAL

1.1 Product Outline

The MP1520B PDH analyzer is a portable error rate measuring instrument which evaluates the signal characteristics under a bit rate of 2 Mb/s, 8 Mb/s, 34 Mb/s, and 139 Mb/s. It is most suitable for evaluating the quality of equipment during manufacture, when constructing a system, and for maintenance after installation.

The input and output impedance conforms to ITU-T recommendation G.703. The pseudorandom pattern conforms to CCITT 0.151/0.152. The frames conform to G.704 (2 Mb/s), G.742 (8 Mb/s), and G.751 (34 Mb/s, 139 Mb/s).

Features

- Loop-back test

  This instrument has both the transmitter section and the receiver section in a single cabinet, and can perform loop-back tests.

- End-to-end test

  End-to-end tests can be performed using two this instrument units.

- In-service test

  Frames which correspond to 2 Mb/s, 8 Mb/s, 34 Mb/s, and 139 Mb/s allow tests to be performed without stopping service.

- Error analysis function

  It is possible to measure the error performance in conformity with the ITU-T recommendations M.2100, G.821, and G.826. It is possible to record how many times an error or alarm occurs, and the recorded data can also be displayed as a bar graph.

- Memory function

  Up to 20 setting conditions can be stored in the internal local memory, and they can be recalled easily from the memory.

  When the power supply is turned on, the equipment reverts to the condition it was set to when the power switch was last turned off. The conditions do not need resetting each time the power supply is turned on.

- MUX/DEMUX function (Option 02)

  The MUX/DEMUX function up to 64 kb/s allows a measurement to be made in a lower layer of the tributary signal.

- Frequency offset function (Option 01)

  The transmit frequency can be changed in 1 ppm steps between −100 ppm and +100 ppm.

- Remote control function (Option 04/05)

  In addition to manual operation, this instrument PDH analyzer can also be operated remotely when the GPIB (Option 04) or RS-232C (Option 05) unit is plugged in. The remote control commands conform to SCPI.

- Jitter generation and measurement function (Option 06)

  Jitter can be generated and measured when the option is installed. The jitter modulation signal is built in.

1.2 Operation Manual Composition (Panel operating instructions)

This operation manual is composed of eight sections, four appendixes, and an index.

Section composition	Explanation
SECTION 1 GENERAL	Provides an outline of the instrument and describes the composition of the manual, equipment configuration with standard accessories, options, optional accessories, and MP1520B specifications.
SECTION 2 PREPARATIONS BEFORE USE	Describes the preparations to be made before using the MP1520B (Installation site environmental conditions, safety measures), and about plugging and unplugging a plug-in unit.
SECTION 3 PANEL FEATURES	Describes the locations and functions of the front-panel and rear-panel keys, LED indicators, and connectors.
SECTION 4 BASIC OPERATING INSTRUCTIONS	Describes the power-on state, the structure and basic operations of each screen, and how to input data.
SECTION 5 DETAILED OPERATING INSTRUCTIONS	Describes the displayed contents of each screen and how to input data for each function.
SECTION 6 MEASUREMENTS	Describes the setting-up and operations for each kind of measurement.
SECTION 7 PERFORMANCE TESTS	Describes the instruments required for performance tests, the test items, and the procedures.
SECTION 8 STORAGE AND TRANSPORTATION	Describes daily servicing, long-term storage, and repacking and transportation.
APPENDIX	Lists abbreviations, initial settings, error codes for self-test, and alarm detection conditions.
INDEX	In alphabetical order

1.3 Equipment Configuration

1.3.1 Equipment configuration with standard accessories

The table below shows the MP1520B configuration with standard accessories.

Table 1-1 MP1520B Configuration with Standard Accessories

Item	Model/Order No.*	Name*	Qty.	Remarks
Main instrument	MP1520B	PDH Analyzer	1	
Accessories	F0014 (F0012)	T6.3 A 250 V (T3.15 A 250 V)	2	6.3 A for 100 Vac system 3.15 A for 200 Vac system
	J0775D	Coaxial cable with BNC-type plug at both ends	1	75 Ω, approx. 2 m
	J0162B	Balanced cord with F plug (three pin) at both ends	1	120 Ω, approx. 2 m
	Z0031A	Thermal paper for printer	2	4 rolls
	W0920AE	MP1520B Operation manual	1	Vol.1 Panel operating instructions
	J0670A	Power cord	1	Approx. 2.5 m
	B0329K	Protective cover	1	For front panel

*Please specify the model/order number, name, and quantity when ordering.

1.3.2 Options

The table 1-2 shows the options for the MP1520B, which are sold separately.

Table 1-2 Options

Model/Order No.*1	Name*1	Remarks
MP1520B-01	Frequency offset	OPT 01*2
MP1520B-02	MUX/DEMUX	OPT 02*2
MP1520B-03	3 ch bipolar output	OPT 03 Plug-in unit
MP1520B-04*3	GPIB interface	OPT 04*4 Plug-in unit
MP1520B-05*3	RS-232C interface	OPT 05*4 Plug-in unit
MP1520B-06	Jitter generation and measurement	OPT 06*2

*1 Please specify the model/order number, name, and quantity when ordering.
*2 This option must be returned to the Anritsu factory for modification.
*3 W0922AE for operation manual
*4 With operation manual (Vol.2 Remote control options) Please specify the model/order number, name, and quantity when ordering.

1.4 Optional Accessories

Table 1-3 shows the optional accessories for the MP1520B, which are all sold separately.

Table 1-3 Optional Accessories

Model / Order No.*	Name*	Remarks
J0008	GPIB cable	Approx. 2 m
J0655A	Serial Interface Cable	Approx. 2 m 9 pin-25 pin
J0697	T-divider	BNC-J
J0698	High impedance pad	20 dB attenuation
B0361A	Shoulder bag	
B0337C	Carrying case	
B0362A	Rack mount kit	

* Please specify the model/order number, name, and quantity when ordering.

1.5 Specifications

This paragraph describes specifications of the MP1520B and the option.

1.5.1 MP1520B Specifications

The MP1520B specifications are listed in Table 1-4.

The asterisk (*) marks placed in the table are used to denote this instrument performance when equipped with an option. The corresponding option number is shown outside the final table margin.

Table 1-4 Specifications (1/5)

Item			Specification
Clock	Bit rate		Internal: 2.048 M, 8.448 M, 34.368 M, 139.264 M b/s External: 2.048 M, 8.448 M, 34.368 M, 139.264 MHz ±100 ppm, Clock bit rate obtained from a received signal
	Accuracy (internal)		±10 ppm
	Offset*1 (internal)		Variable range ±100 ppm in 1 ppm steps
	External clock input	Level/ impedance	0.8 to 1.6 V_{P-P}/75 Ω
		Connector	BNC
Pattern	Pseudorandom binary sequence		$2^{11}-1$ (O.152), $2^{15}-1$ (O.151), $2^{23}-1$ (O.151)
	Word bit length		2, 4, 8, 16 bits
	Frame		ON/OFF possible Format: 2 M (G.704: It is possible to switch, 30/31 ch, turn ON/OFF CRC-4, and turn ON/OFF multi-frame signaling) 8 M (G.742), 34 M (G.751), 139 M (G.751)
MUX/DEMUX*2			MUX: It is possible to insert the above pattern in any channel of the 34 M to n×64k (n=1 to 31. Consecutive TS's are used. TS16 is skipped for n≦30.) tributary signals. DEMUX: It is possible to take any tributary out of the multiplexed signals for error rate measurement.
Output data	Bipolar	Bit rate	2.048 M, 8.448 M, 34.368 M bit/s
		Code	HDB3
		Level/ impedance	2.048 M: 3±0.3 V_{0-P}/120 Ω (Balanced) 2.37±0.237 V_{0-P}/75 Ω (Unbalanced) 8.448 M: 2.37±0.237 V_{0-P}/75 Ω (Unbalanced) 34.368 M: 1±0.1 V_{0-P}/75 Ω (Unbalanced)
		Waveform	Meets ITU-T recommendation G.703
		Number of outputs	Balanced: 1 Unbalanced: 1, 4*3 (Phase difference: Between each 4 bits)
		Connector	Balanced: Siemens 3-pole Unbalanced: BNC

Table 1-4 Specifications (2/5)

Item			Specification
Output data	CMI	Bit rate	139.264 Mbit/s
		Level /impedance	1±0.1 V_{P-P}/75 Ω
		Waveform	Meets ITU-T recommendation G.703
		Number of outputs	1 (common to bipolar)
		Connector	BNC
Input data	Bipolar	Bit rate	2.048 M, 8.448 M, 34.368 M bit/s±100 ppm
		Code	HDB3
		Level/ termination	The cable loss below shows the value measured at one-half frequency of the input signal bit rate (nominal value) 2.048 M: 3±0.3 V_{0-P} + 0 to 6 dB cable loss/120 Ω (Balanced) 2.37±0.237 V_{0-P} + 0 to 6 dB cable loss/75 Ω (Unbalanced) 8.448 M: 2.37±0.237 V_{0-P} + 0 to 6 dB cable loss/75 Ω (Unbalanced) 34.368 M: 1±0.1 V_{0-P} + 0 to 12 dB cable loss/75 Ω (Unbalanced) Monitor: The level when the above level is attenuated additionally to 20 dB.
		Number of inputs	Balanced: 1 Unbalanced: 1
		Connector	Balanced: Siemens 3 poles Unbalanced: BNC
	CMI	Bit rate	139.264 Mbit/s±100 ppm
		Level/ termination	1±0.1 V_{P-P} + 0 to 12 dB cable loss (70 MHz) /75 Ω Monitor: The level when the above level is attenuated additionally to 20 dB.
		Number of inputs	1 (common to bipolar)
		Connector	BNC
Error insertion	Types		Bit, Code (Bipolar or CMI)
	Insertion method		The bit error is inserted after the CRC calculation and the frame signal has been applied. So, the bit error insertion with generate the CRC error and/or the frame error. The LED lights when an error is inserted. It is possible to insert a bit error in any layer of the tributary signal*2.
	Insertion range		Single, 10^{-7}, 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}
Alarm insertion	Types		AIS, FAS alarm, Remote alarm, Multi-frame remote alarm
	Insertion method		The LED lights when an alarm is inserted. It is possible to insert an alarm in any layer of the tributary signal*2.
	Insertion range (at FAS alarm)		1/16, 2/16, 3/16, 4/16

Table 1-4 Specifications (3/5)

Item		Specification
Error measurement	Error types	The errors below are detected simultaneously. Out-of-service: Bit, Code, CRC, Frame In-service: Code, CRC, Frame When DEMUX is set to ON, the errors in each layer frame are also detected simultaneously (1 ch at a time for each layer frame)*2
	Measurement items	The measurements below are executed simultaneously. (However, only one type of performance is selected.) Error Count (EC), Error Rate (ER), Error Seconds (ES), Performance Performance: G.821: %ES, %SES, %DM, %US, Determination by setting a threshold level. G.826: ESR, SESR, BBER, %US, Determination by setting a threshold level. M.2100: ES, SES, Determination by setting a threshold level. Errors used for measurement. • Out-of-service: Bit error • In-service G.821: Frame error G.826, M2100: CRC-4 error when CRC-4 is ON. Frame error when CRC-4 is OFF. When DEMUX is set to ON, the frame error for either tributary signal can also be used.*2
	Display range	EC, ES, SES 0 to 999999, 1.00E+06 to 9.99E+15, >9.99E+15 ER, ESR, SESR, BBER 0.00E−15 to 1.00E+00, <1.00E−15 %ES, %SES, %DM, %US 0.0000 to 100.0000%
	Lamp display	Red : While any of the error types are being detected. (except for power fail) Orange : When any of the error types have already been detected (history). The history can be reset.
Alarm detection	Alarm types	The alarms below are detected simultaneously. For alarm detection conditions, see Appendix C. Signal loss, AIS, Frame loss, Remote alarm Multi-frame loss, Multi-frame remote alarm Pattern sync loss, Power fail When DEMUX is set to ON. The frame errors in each layer are also detected simultaneously (1 ch at a time for each layer frame)
	Measurement item	Total seconds of alarm
	Display range	0 to 999999, 1.00E + 06 to 9.99E +15, >9.99E +15 (seconds)
	Lamp display	Red : While any of the alarm types are being detected. (except power fail) Orange : When any of the alarm types have already been detected (history). The history can be reset.

Table 1-4 Specifications (4/5)

Item		Specification
Frequency measurement	Measurement range	−100.0 to +100.0 ppm
	Accuracy	±4 ppm
	Display	Displays the frequency deviation in ppm
Measurement period	Measurement mode	Single, Repeat, Manual
	Measurement time	1 to 99 s (second), 1 to 99 m (minute), 1 to 99 h (hour), 1 to 99 d (day) except for manual mode. Start/Stop
	Programmable start	Enabled
	Time display	Displays elapsed time (Elapsed), remaining time (Timed. Except for manual mode), or current time .
Clock sync output	Output level	0.5±0.1 V_{P-P}
	Impedance	75 Ω
	Connector	BNC
Printer	Printer type	Thermal printer. 28 characters/line
	Print contents/ print timing	Measurement conditions: Measurement conditions/at the time of measurement start Measured result data: All the measurement data/at the time of measurement end Error occurrence: EC or ER for one second of all the errors generated/at the time of error occurrence Alarm occurrence: All the alarms generated/at the time of the alarm occurrence and alarm recovery Intermediate data: The same contents as measured result data. Switching between the data with every period and the data accumulated from measurement start/every period set. The period: 1 to 99 s (second) 1 to 99 m (minute), 1 to 99 h (hour), 1 to 99 d (day) Screen information: Screen information/when the COPY key is pressed
	Print limits	The print ON/OFF is possible. Measured result data: Items can be selected (Error types, performance data print ON/OFF, alarm data print ON/OFF) Error occurrence: A threshold limit value is set, and paper saving is possible. Threshold level EC: Always printed, >1, >10, >100, >1000 ER: Always printed, $>10^{-3}$, $>10^{-4}$, $>10^{-5}$, $>10^{-6}$ Paper saving • Printing is stopped after 10 seconds continuous printing • Resumes printing when an error below the threshold limit value occurs continuously for more than 10 seconds. Intermediate data: It can be selected for continuous printing or printing only if an error or an alarm occurs in the previous period.

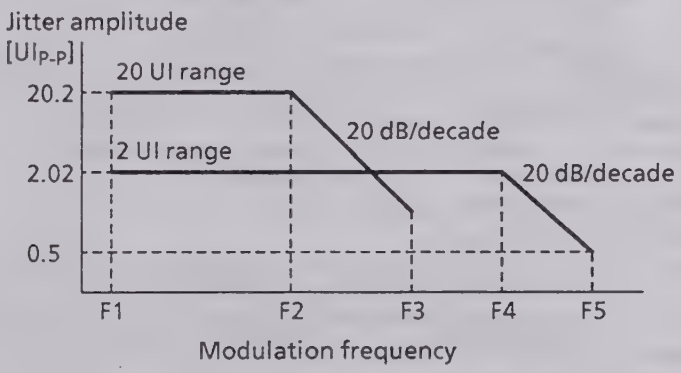
Table 1-4 Specifications (5/5)

Item		Specification
Other functions	Display	Current display (displays the measured value during measurement) Last display (displays the measured value each time measurement is completed.) Zoom display
	Graph display	Simultaneously displays the generation history of the selected alarms. Measurement interval: 1 s (second), 10 s, 1 m (minute), 10 m, 1 h (hour), 6 h, 1 d (day), 4 d • Bar graph display of measured value distribution (EC or ER)
	Memory for measured value	Stores about 10,000 lines of measured results, error and alarm occurrences
	Memory for setting conditions	Up to 20 settings back-uped can be stored (Battery-backed-up) The setting conditions when the power was last turned off are also stored.
	Buzzer	Error, alarm
	Self-test function	Incorporated
	Display unit	LCD display. 40 × 15 characters. 320 × 240 dots. Graphic display is possible.
	Built-in timer	Setting of year, month, day, hour, minute, and second (battery-backed-up)
	Panel lock	Available
External control	Interface	GPIB*4 or RS-232C*5
Conditions for use	Ambient temperature, rated range of use	0 to 50℃
	Storage temperature	−20 to 70℃
Power requirements	Line voltage	85 to 139 Vac or 170 to 250 Vac
	Line frequency	47 to 63 Hz
	Power dissipation	≦200 VA
Dimensions and mass	Dimensions	177 (H), 284 (W), 350 (D) mm
	Mass	≦11 kg

*1: Available when OPT 01 is incorporated.
*2: Available when OPT 02 is incorporated.
*3: Available when OPT 03 is incorporated.
*4: Available when OPT 04 is incorporated.
*5: Available when OPT 05 is incorporated.

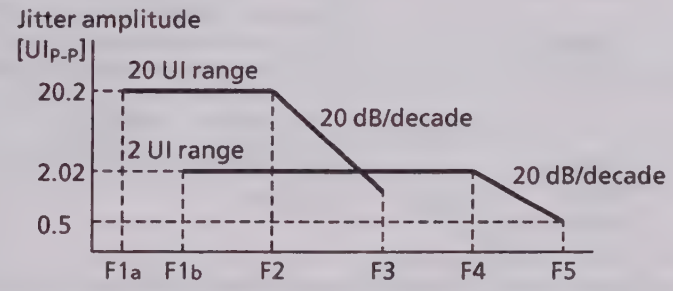
Table 1.5 lists the jitter option specifications.

Table 1-5 Specifications (1/4)

<table>
<tr><th colspan="3">Item</th><th>Specification</th></tr>
<tr><td rowspan="10">Jitter modulation</td><td colspan="2">Bit rate</td><td>2.048 M, 8.448 M, 34.368 M, 139.264 M b/s ±100 ppm</td></tr>
<tr><td rowspan="2">Internal modulation signal</td><td>frequency</td><td>2 Hz to 99 Hz/Step 1 Hz
100 Hz to 990 Hz/Step 10 Hz
1 kHz to 9.9 kHz/Step 0.1 kHz
10 kHz to 99 kHz/Step 1 kHz
100 kHz to 990 kHz/Step 10 kHz
1 MHz to 4 MHz/Step 0.1 MHz</td></tr>
<tr><td>Accuracy</td><td>±100 ppm</td></tr>
<tr><td rowspan="3">External modulation signal</td><td>frequency</td><td>2 Hz to 4 MHz</td></tr>
<tr><td>Sensitivity</td><td>2 UI range: 2 UI_{p-p}/1 V
20 UI range: 20 UI_{p-p}/1 V</td></tr>
<tr><td>Termination/ connector</td><td>75 Ω/BNC</td></tr>
<tr><td rowspan="2">Jitter amplitude</td><td>Range</td><td>2 UI (0.000 to 2.020 UI_{p-p}/Step 0.001 UI_{p-p})
20 UI (0.00 to 20.20 UI_{p-p}/Step 0.01 UI_{p-p})</td></tr>
<tr><td>Jitter frequency versus Jitter amplitude characteristics</td><td>Meets ITU-T recommendation 0.171.
 

<table>
<tr><th>Bit rate</th><th>F1 (Hz)</th><th>F2* (Hz)</th><th>F3* (Hz)</th><th>F4* (Hz)</th><th>F5* (Hz)</th></tr>
<tr><td>2 M</td><td>2</td><td>1 k</td><td>20 k</td><td>27.5 k</td><td>110 k</td></tr>
<tr><td>8 M</td><td>2</td><td>1 k</td><td>20 k</td><td>105 k</td><td>420 k</td></tr>
<tr><td>34 M</td><td>2</td><td>5 k</td><td>100 k</td><td>250 k</td><td>1 M</td></tr>
<tr><td>139 M</td><td>2</td><td>5 k</td><td>100 k</td><td>1 M</td><td>4 M</td></tr>
</table>
*: Typical value</td></tr>
</table>

Table 1-5 Specifications (2/4)

<table>
<tr><th colspan="3">Item</th><th>Specification</th></tr>
<tr><td>Jitter modulation</td><td>Jitter amplitude</td><td>Accuracy</td><td>2 UI range: ±5%±0.05 UI_{p-p}/at 1 kHz
20 UI range: ±5%±0.3 UI_{p-p}/at 1 kHz
Frequency error (reference: 1 kHz)
2 UI range: ±2% (F1 to F4), ±5% (F4 to F5)
20 UI range: ±2% (F1 to F2), ±5% (F2 to F3)</td></tr>
<tr><td rowspan="5">Jitter measurement</td><td colspan="2">Bit rate</td><td>2.048 M, 8.448 M, 34.368 M, 139.264 M b/s ±50 ppm</td></tr>
<tr><td rowspan="4">Jitter amplitude</td><td>Measurement</td><td>Peak to Peak, +Peak to Zero, −Peak to Zero</td></tr>
<tr><td>Range</td><td>2 UI (0.000 to 2.020 UI_{p-p}/0.000 to ±1.010 UI_{0-p})
20 UI (0.00 to 20.20 UI_{p-p}/0.00 to ±10.10 UI_{0-p})
Auto</td></tr>
<tr><td>Jitter frequency versus Jitter amplitude characteristics</td><td>Meets ITU-T recommendation 0.171.
 

<table>
<tr><th>Bit rate</th><th>F1a (Hz)</th><th>F1b (Hz)</th><th>F2* (Hz)</th><th>F3* (Hz)</th><th>F4* (Hz)</th><th>F5* (Hz)</th></tr>
<tr><td>2 M</td><td>10</td><td>20</td><td>1 k</td><td>20 k</td><td>25 k</td><td>100 k</td></tr>
<tr><td>8 M</td><td>10</td><td>20</td><td>1 k</td><td>20 k</td><td>100 k</td><td>400 k</td></tr>
<tr><td>34 M</td><td>50</td><td>100</td><td>5 k</td><td>100 k</td><td>200 k</td><td>800 k</td></tr>
<tr><td>139 M</td><td>100</td><td>200</td><td>5 k</td><td>100 k</td><td>875 M</td><td>3.5 M</td></tr>
</table>
*: Typical value</td></tr>
<tr><td>Accuracy</td><td>2 UI range: ±5%±0.01 UI*±X UI*/at 1 kHz (HP1+LP)
20 UI range: ±5%±0.1 UI*±X UI*/at 1 kHz (HP1+LP)
X 2 UI range: 0.025/2,8M, 0.055/34M, 0.085/139M
20 UI range: 0.12/2, 8, 34M, 0.2/139M
(UI*=UI_{p-p}: Peak to Peak, UI_{0-p}: Peak to Zero)
Frequency error (reference: 1 kHz)
2 Hz to 20 Hz: ±5% 1 MHz to 3 MHz: ±5%
20 Hz to 300 kHz: ±2% 3 MHz to 4 MHz: ±10%
300 kHz to 1 MHz: ±3%</td></tr>
</table>

Table 1-5 Specifications (3/4)

<table>
<tr><th colspan="3">Item</th><th>Specification</th></tr>
<tr><td rowspan="5">Jitter measure-ment</td><td colspan="2">Filter</td><td>OFF, HP1, HP2, HP2 (N), LP, HP1 + LP, HP2 + LP, HP2 (N) + LP
<table>
<tr><th>Bit rate</th><th>HP1</th><th>HP2</th><th>HP2 (N)</th><th>LP</th></tr>
<tr><td>2 M</td><td>20 Hz</td><td>18 kHz</td><td>700 Hz</td><td>100 kHz</td></tr>
<tr><td>8 M</td><td>20 Hz</td><td>3 kHz</td><td>80 kHz</td><td>400 kHz</td></tr>
<tr><td>34 M</td><td>100 Hz</td><td>10 kHz</td><td>—</td><td>800 kHz</td></tr>
<tr><td>139 M</td><td>200 Hz</td><td>10 kHz</td><td>—</td><td>3.5 MHz</td></tr>
</table></td></tr>
<tr><td>Meas-urement mode</td><td>Interval</td><td>0.2 s, 1 s, 10 s, Coupled
(Synchronized with error measurement period)</td></tr>
<tr><td colspan="2">Display</td><td>Current: Values during measurement are displayed. Max. value within interval is renewed every 0.2 sec.
Last: Measured value is displayed upon expiration of interval.</td></tr>
<tr><td rowspan="2">Demod signal output</td><td>Amplitude</td><td>2 UI range: 1 V/2 UI_{P-P}
20 UI range: 1 V/20 UI_{P-P}</td></tr>
<tr><td>Termina-tion/ connector</td><td>75 Ω/BNC</td></tr>
<tr><td rowspan="5">Hit measure-ment</td><td colspan="2">Measurement item</td><td>No Hit measurement is conducted when receiver range is Auto.
Hit Count: Number of jitters exceeding set jitter amplitude thresholds (positive and negative sides) is measured.
Hit Seconds: Total of 1 Hit second with one or more Hit count.
% Hit Free Secound: Ratio without Hit seconds against total error measurement period</td></tr>
<tr><td colspan="2">Threshold</td><td>2 UI range: 0.05 to 1.00 UI_{0-P}/Step 0.01 UI_{0-P}
20 UI range: 0.5 to 10.0 UI_{0-P}/Step 0.1 UI_{0-P}</td></tr>
<tr><td colspan="2">Half value width of jitter signal</td><td>100 ns or more</td></tr>
<tr><td colspan="2">Display range</td><td>Hit Count, Hit Seconds: 0 to 999999 to 9.99E15, >1E16
% Hit Free Second: 0.0000 to 99.9999, 100%</td></tr>
<tr><td colspan="2">Interval</td><td>Same period as that of error measurement</td></tr>
<tr><td colspan="2">Display</td><td>Current: Values during measurement are indicated. Hit count is renewed every 0.2 sec while others, every 1 sec.
Last: Measured value is indicated upon completion of error measurement.</td></tr>
</table>

Table 1-5 Specifications (4/4)

Item		Specification
Jitter sweep mask measurement	Measurement contents	While changing modulation frequency according to pre-set modulation frequency/jitter amplitude table, error occurrence is checked.
	Measurement point	Max. 10
	Number of programs	Has fixed and user set values for 2 M, 8 M, 34 M and 139 M each. For 2 M and 8 M two types of fixed values are available.
	Display	Graph display
Jitter transfer measurement	Measurement contents	Jitter gain is measured by changing modulation frequency according to pre-set modulation frequency/jitter amplitude table.
	Measurement point	Max. 10
	Number of programs	Has fixed and user set values for 2 M, 8 M and 34 M each. User set value only for 139M. For 2 M two types of fixed values are available.
	Display	Graph and numerical display
	Calibration function	Yes
Frequency-jitter measurement	Measurement contents	Max. jitter quantity is measured while changing transmitter frequency. Measurement is possible only when option 01 (frequency offset) is installed.
	Frequency offset	Max. ±50 ppm/Step 1 to 100 ppm
	Measurement interval	1 to 60 s
	Display	Graph display, while max. jitter quantity and modulation frequency at that time are numerically displayed.

1.5.2 Specifications of MP1520B option 01/02/03

Specifications of the MP1520B option 01/02/03 are listed in the following table.

OPT 01: Frequency offset

Item	Specification
Bit rate	2.048 M, 8.448 M, 34.368 M, 139,264 Mb/s
Variable range	±100 ppm in 1 ppm steps

OPT 02: MUX/DEMUX

Item	Specification
Mapping	Any subset of the following 139 M − 34 M − 8 M − 2 M − n×64 kb/s n: 1 to 31. Consecutive TS's are used (TS16 is skipped for n≦30), according to G.704.
Error/Alarm insertion	It is possible to insert an error or an alarm in any layer of the tributary signal.
Measurement	All layer frame error and alarm are measured simultaneously.

OPT 03: 3 ch bipolar outputs

Item	Specification
Bit rate	2.048 M, 8.448 M, 34.368 Mb/s
Code	HDB3
Level/impedance	2M/8M: 2.37 ± 0.237 Vo-p/75 Ω 34M: 1 ± 0.1 Vo-p/75 Ω
Waveform	Meets ITU-T recommendation G.703
Number of output	3 (Phase difference: Between each 4 bits)
Connector	BNC

Note: *For OPT04: GPIB/OPT05: RS-232C refer to the MP1520B Operation Manual Vol.2 Remote Control Option.*

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PREPARATIONS BEFORE USE

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2.1.2 Safety measures 2-3
2.2 Plugging and Unplugging a Plug-in Unit 2-4

(Blank)

SECTION 2
PREPARATIONS BEFORE USE

2.1 Precautions

2.1.1 Installation site environmental conditions

This instrument operates normally at ambient temperatures from 0 to 50 ℃. However, avoid using this instrument in any of the following locations:

- Where there is severe vibration
- Where there is high humidity or dust
- Where there is direct exposure to sunlight
- Where there is exposure to corrosive gases

CAUTION

- *When installing the MP1520B, make sure that the fan ventilation grilles in the rear panel and bottom cover are not obstructed. The rear panel must be at least 10 cm from nearby equipment or other obstacles to allow free air circulation. Insufficient air circulation allows the internal temperature to increase and may cause component damage.*
- *If the MP1520B is operated at room temperature after being used for a long time at low temperature, such as 0°C, there is a risk of short-circuiting caused by condensation. To prevent this, allow the MP1520B to dry out completely before turning the power on.*

2.1.2 Safety measures

This instrument requires a single phase ac power source of 85 to 139 Vac for the 100 Vac system or 170 to 250 Vac for the 200 Vac system, and 47 to 63 Hz. Make sure that the line voltage used is within the power-supply voltage rating range for this instrument before plugging the ac power cord plug into the ac outlet.

- To prevent electric shock, if using a two-pin ac outlet, connect the frame-ground terminal on the rear panel to ground potential.
- Before connecting this instrument to other instruments, check that the output and input levels are suitable.
- Replace the plug-in unit before turning on the power.
- Connect any peripherals, including printers, after turning on the power.

Note: *Immunity for Electro static discharge (ESD). The MP1520B might be possible to occur errors and alarms by ESD in monitor mode.*

2.2 Plugging and Unplugging a Plug-in Unit

CAUTION

When replacing the plug-in unit, be careful not to injure your fingers.

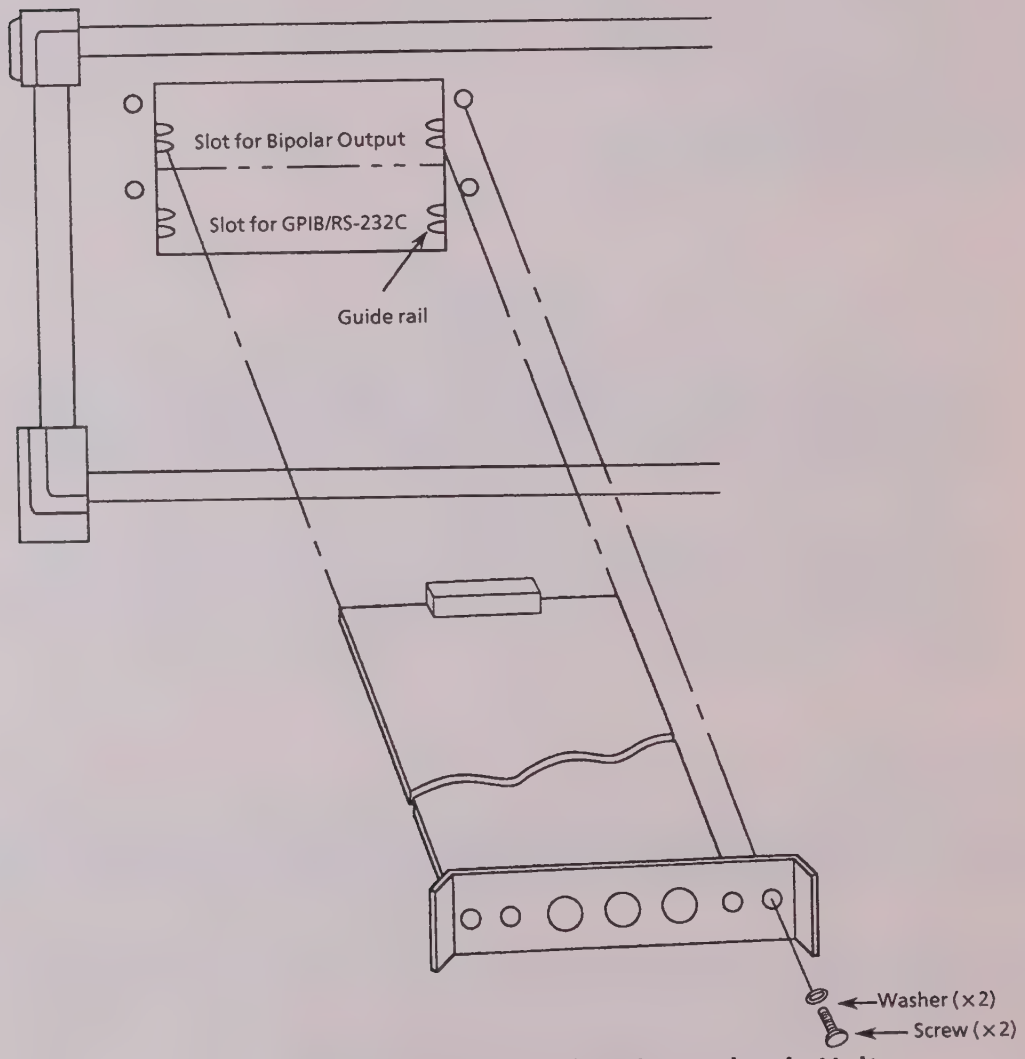

Fig. 2-1 Plugging and Unplugging a Plug-in Unit

Step	Procedure
1	Check that the power switch is turned OFF before replacing the plug-in unit.
2	Check the slot positions shown in Fig. 2-1 before plugging the plug-in unit.
3	To plug the plug-in unit in the slot, fit the unit end accurately to the two guide rails inside the slot, push the unit into the inner part so that its connector mates firmly, then tighten the right-to-left screws. Plugging the unit or tightening the screws incorrectly may cause faulty operation.
4	It is recommended that a slot with no plug-in unit be lidded with a blank panel.

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PANEL FEATURES

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SECTION 3
PANEL FEATURES

3.1 Panel

3.1.1 Main instrument panel features

The front and rear panels of the MP1520B Analyzer are shown in the figures below and described on the pages that follow.

- **Front panel**

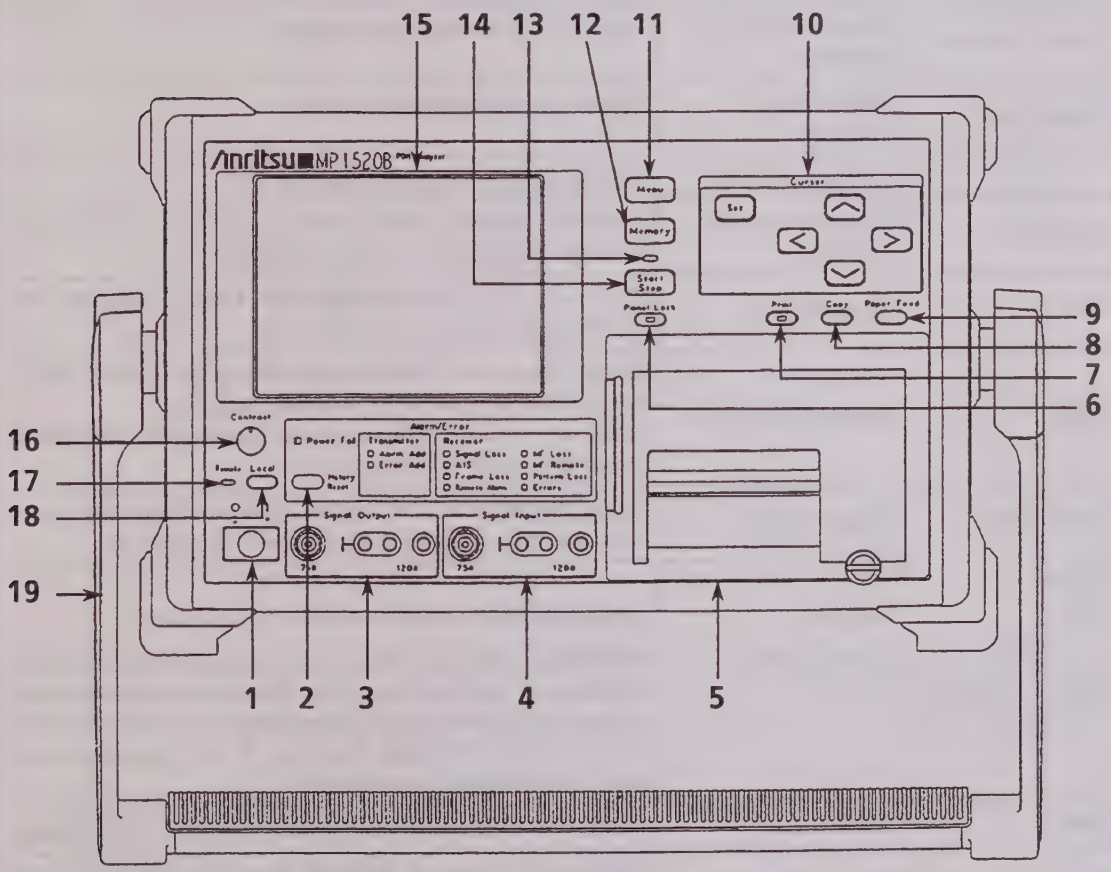


Fig. 3-1 Front Panel

Table 3-1 Front Panel Description (1/2)

No.	Label	Name	Description
1	O I	Line AC power switch	Turns on or off line AC power. The line AC power is supplied to the MP1520B when the switch is turned on.
2	Alarm/Error History Reset	Alarm/Error LEDs	The LEDs light when an alarm or error is inserted. The Alarm/Error section is divided into Transmitter and Receiver sections. Red: While any of the error types is being detected. Orange: When any of the error types has already been detected. When the History key is pressed, the LED which is currently orange is reset.
3	Signal Output	Signal output connector	Outputs the measurement signal
4	Signal Input	Signal input connector	Inputs the measurement signal
5		Built-in printer	Prints out the measured results
6	Panel Lock	Panel operation lock key	Disables manual front-panel operation. The panel settings are locked while the LED is lit.
7	Print	Printing key	Turns on or off the printing of the built-in printer. The printing is on while the LED is lit.
8	Copy	Screen copy key	Allows the screen display contents to be printed out at the built-in printer or an external printer. Print out to the built-in printer cannot be executed if the printing key LED is not lit.
9	Paper Feed	Paper feed key	Feeds the paper loaded in the built-in. The paper is fed continuously while this key is pressed and held.
10	Cursor Set 	Set key Cursor keys	Opens and closes the Set window to set data. Move the cursor and window cursor on the screen in the direction of the arrows. In the Set window for numeric data entry, the data can be increased or decreased using the ↑ or ↓ key. Holding down the ↑ or ↓ key allows the data to be changed continuously.
11	Menu	Menu key	Opens and closes the Menu window to select the screen.
12	Memory	Memory recall key	Retrieves the stored settings from the specified local memory location
13		Measurement in progress LED	Lights when measurement or self-diagnosis is in progress
14	Start/Stop	Measurement start/stop key	Starts/stops (completes) measurement or self-diagnosis
15		LCD screen	Displays measurement items, settings, and measured results

Table 3-1 Front Panel Description (2/2)

No.	Label	Name	Description
16	Contrast	Contrast adjustment knob	Adjusts the LCD screen contrast (intensity)
17	Remote	Remote LED	Lights when the instrument is in remote mode, controlled by GPIB or RS-232C
18	Local	Local key	Releases the instrument from remote mode and switches to local mode which enables manual front-panel operation
19		Tilt handle	Press both ends of the mounting section inwards to tilt the instrument

• Rear panel

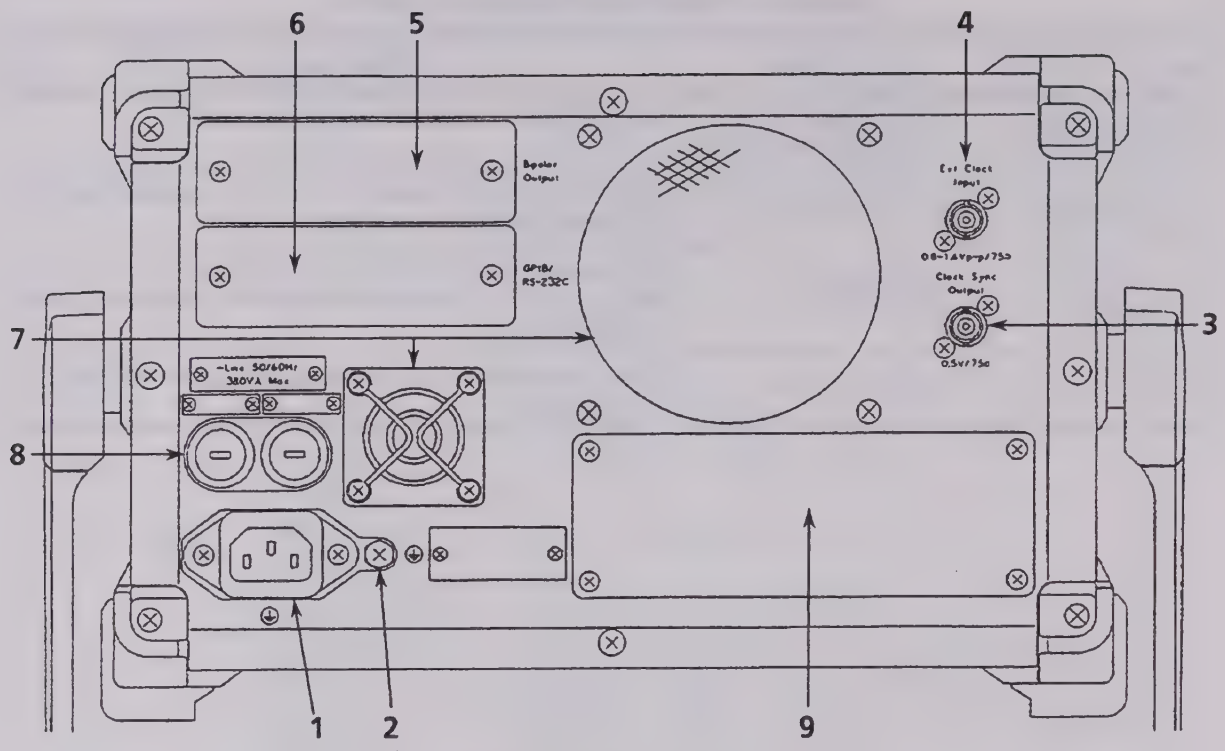


Fig. 3-2 Rear Panel

Table 3-2 Rear Panel Description (1/2)

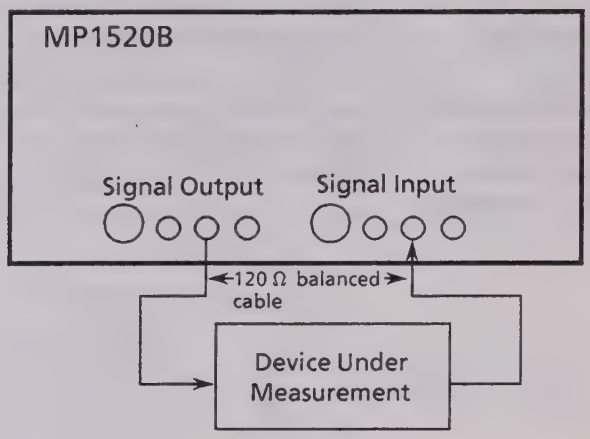
No.	Label	Name	Description
1		AC power inlet	Plug in the supplied power cord here
2		Frame ground terminal	To prevent electric shock, connect this terminal to ground
3	Clock Sync Output	Clock sync output connector	Outputs the clock signal for synchronization to observe an output signal waveform
4	Ext Clock Input	External clock input connector	Inputs the external clock.
5		3 ch bipolar output plug-in unit insertion slot	Insert the 3 ch bipolar output plug-in unit into this slot. This unit is an option. A blank panel is attached on this place when the instrument is not equipped with this option.
6		Remote control interface plug-in unit insertion slot	Insert the remote control interface plug-in unit into this slot for control by an external controller or when an external printer is connected.GPIB or RS-232C can be used as an remote control interface unit. These units are options. A blank panel is attached on this place when the instrument is not equipped with these options.
7		Fans	Cooling fans for dissipating the heat generated inside the MP1520B

Table 3-2 Rear Panel Description (2/2)

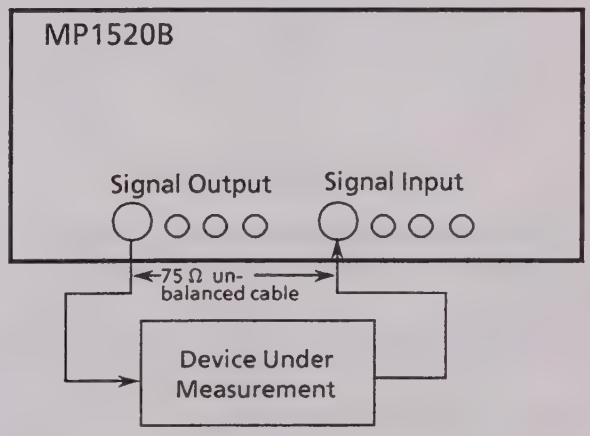
No.	Label	Name	Description
8		Fuse holder	Fuse holder for line AC power
9	Ext Mod Input Demod Output	External modulation signal input connector Demod signal output connector	Input connector and output connector for jitter modulation and demodulation signals when a jitter option is equipped. A blank panel is attached on this place when the jitter function (option) is not equipped.

3.2 Setup

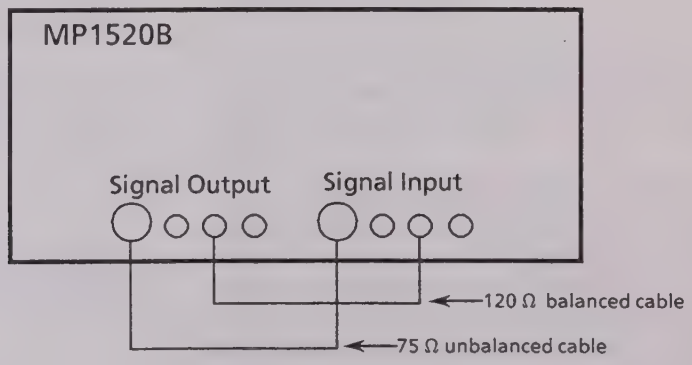
(1) Connecting 120 Ω balanced cable (Only at 2 M)



(2) Connecting 75 Ω unbalanced cable



(3) Connecting cables for self-test



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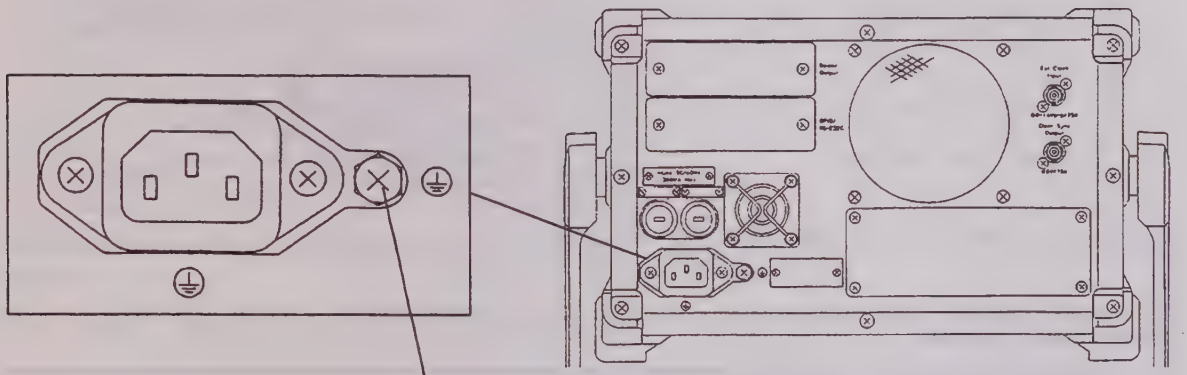
SECTION 4
BASIC OPERATIONS

4.1 Instrument Status at Power-on

Before supplying power to this instrument, ground the instrument as described in Paragraph 2.1.2 (P.2-3) "Safety measures", then plug the supplied power cord into the AC inlet.

WARNING

Turning on the power without protective grounding may result in injury from an accidental electric shock. When a 3-pin (grounded 2-pin) AC outlet is not available, always connect the rear-panel frame ground (FG) terminal or power-cord grounded line to ground potential before supplying power to this instrument.

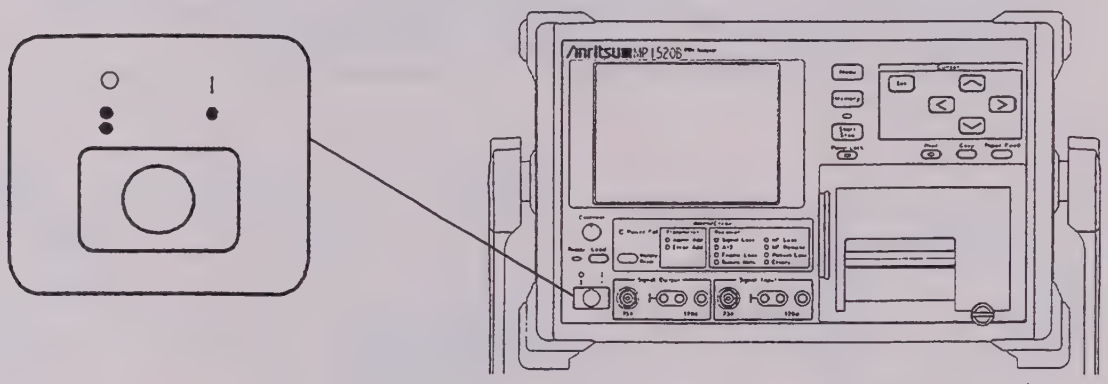


Frame ground terminal: To prevent accidental electric shock, connect this terminal to ground potential.

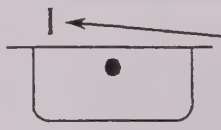
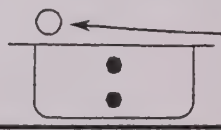
CAUTION

*Abnormal AC line voltage may damage this instrument. Before turning on the power to this instrument, check that the AC line voltage is the specified value ** Vac (85 to 139 Vac for the 100 Vac system or 170 to 250 Vac for the 200 Vac system).*

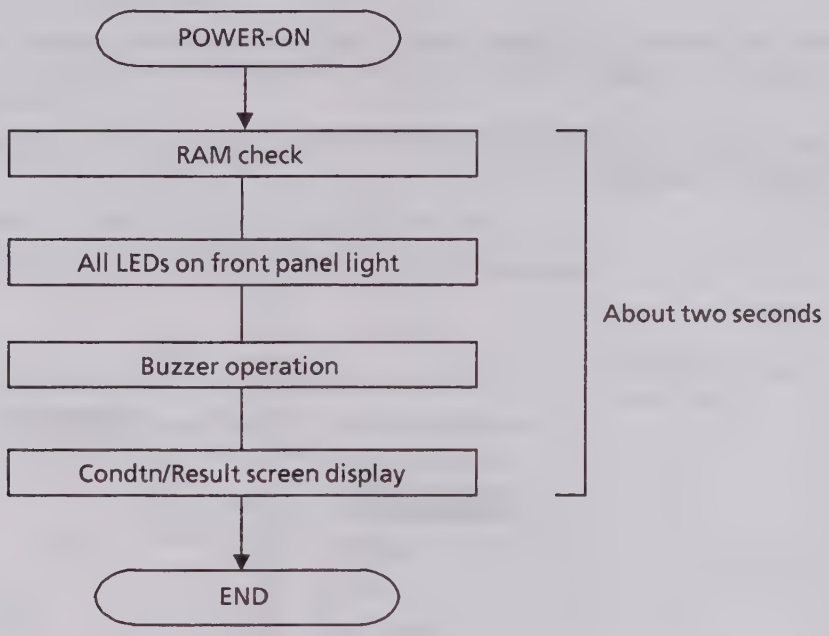
This instrument power switch is located on the front panel as shown below. This switch is labeled with two symbols: The "I" indicates the power on position; the "○" indicates the power off position.



Power push button

	ON status symbol	When this button is pressed, it stays recessed, power is supplied to all this instrument circuits, and this instrument becomes ready for operation.
	OFF status symbol	When this button is pressed in the ON state, it pops out, and the AC power is turned off.

The following flowchart outlines the processing that occurs in this instrument when the power is turned on:



This instrument stores the conditions set immediately before the power is turned off in the internal memory.

When the power is turned on, the MP1520B status becomes the one when the power was last switched off.

***Note**: The following items are always set to their initial states when the power is turned on:*

Item	Initial value
Remote state	Local
Panel locked state	OFF
Printer enable state	Disable state
Screen	Condtn/Result screen
Measurement start time	OFF

4.2 Screen Layout

Figure 4-1 shows the screen layout of this instrument.

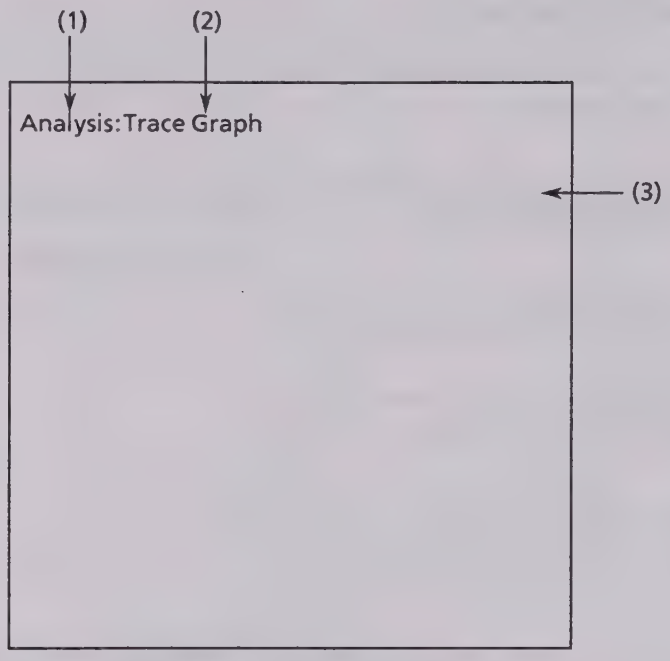


Fig. 4-1 Screen Layout

Table 4-1 Screen Description

No.	Display area name	Description
(1)	Main screen name display	Displays the name of the main screen.
(2)	Subscreen name display	Displays the name of the subscreen.
(3)	Individual display	Displays the individual items on each screen.

Notes: • *The Condtn/Result screen is divided into upper and lower screens. The Condtn screen is displayed at the top. The Result screen is displayed at the bottom. Both of these screens have subscreens.*

• *Some screens have no subscreens.*

4.3 Selecting the Screen

This instrument has five main screens to set data items and perform measurements. Subscreens can be set on some main screens.

A main screen can be set in the Menu window displayed by pressing the Menu key. A subscreen can be set in the Set window displayed by pressing the Set key while the inverted cursor is positioned on the subscreen.

(1) to (3) explain how to set a main screen. (4) to (6) explain how to set a subscreen.

(1) Press the Menu key to open the Menu window.

The window cursor is displayed on the currently set screen.

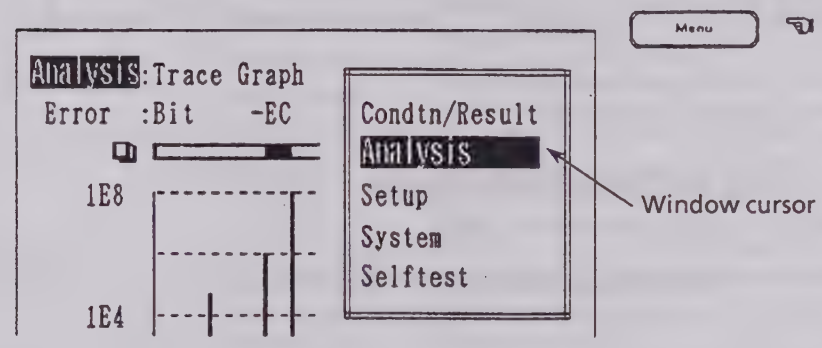


Fig. 4-2 Menu Window Display

(2) Use the ↑ or ↓ key to move the window cursor to select the object main screen.

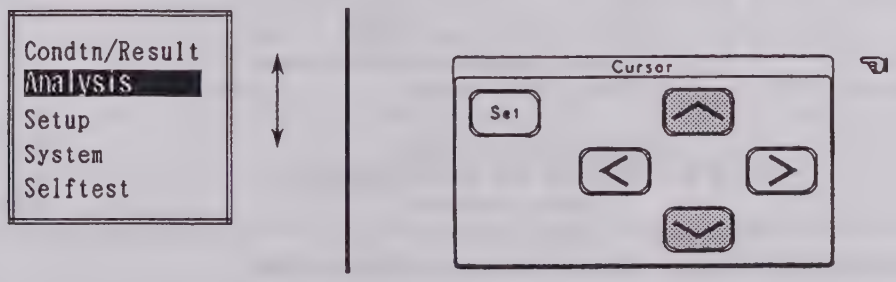


Fig. 4-3 Selecting the Menu Window

(3) Press the Menu or Set key to close the Menu window and switch to the selected screen.

(4) Move the cursor to the subscreen and press the Set key to open the Set window. The window cursor is displayed on the currently set subscreen.

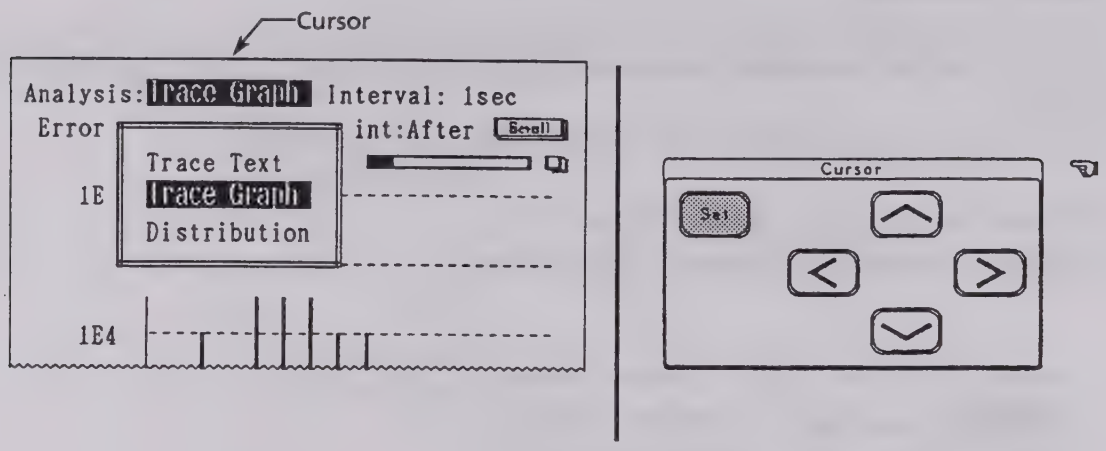


Fig. 4-4 Set Window Display

(5) Use the ↑ or ↓ key to move the window cursor to select the object subscreen.

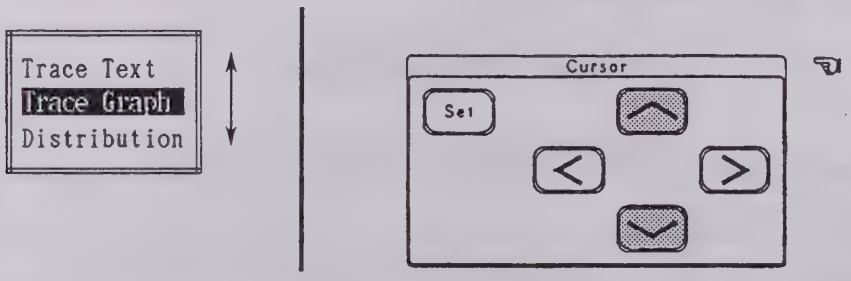


Fig. 4-5 Selecting the Set Window

(6) Press the Set key to close the Set window and switch to the selected screen.

Notes: ■ *The keys are invalid in the following states:*
- *Remote control state*
- *Panel lock ON state*

■ *Only one window can be displayed at one time.*

4.4 Screen Configurations

4.4.1 Configuration

Table 4-2 Main and subscreen configurations

Main screen name	Subscreen name	Description
Condtn	—	Sets a measuring condition of the transmitter or receiver section.
Result	—	Displays a measured error or alarm.
Analysis	Trace Text	Displays the error alarm history of a measurement period as text.
	Trace Graph	Displays the error alarm history of a measurement period in bar graph format.
	Distribution	Displays a percentage of error distribution during a measurement period in seconds and in bar graph format.
Setup	Measure	Sets some measurement conditions.
	Performance	Sets a performance measurement condition.
	Print	Sets a printing condition.
	Memory	Sets the memory.
Jitter	Manual	Sets jitter generation and measurement settings and indicates results.
	Sweep mask	Measures jitter tolerance using sweep mask.
	Transfer	Measures jitter transfer characteristics.
	Jitt/Freq	Measures frequency-jitter amplitude characteristics.
System		Sets a system condition.
Selftest		Performs selftest.

Notes: • *Condtn and Result comprise one screen.*

- *A screen cannot be switched to the Selftest screen during a measurement.*
- *A screen can be switched only to the Selftest screen during selftest.*
- *The jitter screen is displayed only when the jitter generation/measurement option is installed.*
- *The Jitt/Freq screen for jitter measurement is displayed only when the frequency offset and jitter generation/measurement options are installed.*

4.4.2 Condtn/Result screen

The Condtn/Result screen is divided into two screens as shown in Fig. 4-6. The Condtn screen is displayed at the top. The Result screen is displayed at the bottom.

The Condtn screen displays the setting conditions that need to be changed frequently. These measurement conditions can be changed while checking the measured results displayed on the Result screen underneath.

Measurement conditions of the transmitter and receiver sections can be set together (Tx&Rx) or individually (Tx or Rx) on the Condtn screen.

An alarm or error during a measurement is displayed in real-time mode or in each measurement cycle on the Result screen. An alarm or error to be processed can be enlarged on the screen. An error or performance measurement result (Error) and alarm measurement result (Alarm1 or Alarm2) can be displayed on the Result screen.

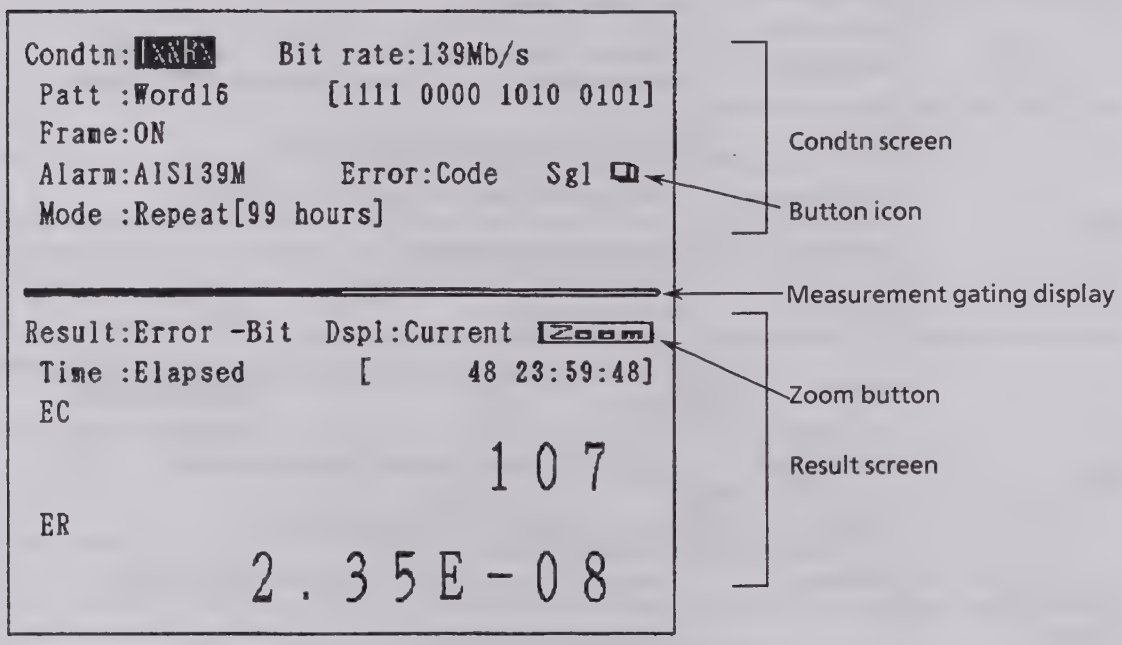


Fig. 4-6 Condtn/Result Screen

The Condtn and Result screens do not have subscreens.

Notes: • *The screen display differs depending on the items set or option applied.*

• *If alarm measured results cannot be displayed on Alarm 1 of the Result screen, Alarm 2 can be selected.*

4.4.3 Analysis screen

The condition of an alarm or error in a directly previous measurement cycle is displayed on the Analysis screen. The Analysis screen has three subscreens. Alarm or error conditions can be displayed in text format (Trace Text) or bar graph format (Trace Graph) on these subscreens. Percentages of error distribution (Distribution) can also be displayed on these subscreens.

The subscreens of the Analysis screen are as follows:

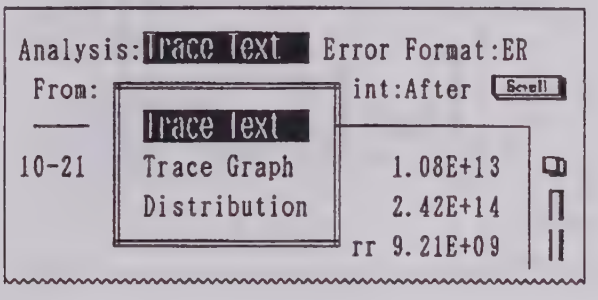


Fig. 4-7 Subscreen Menu of Analysis Screen

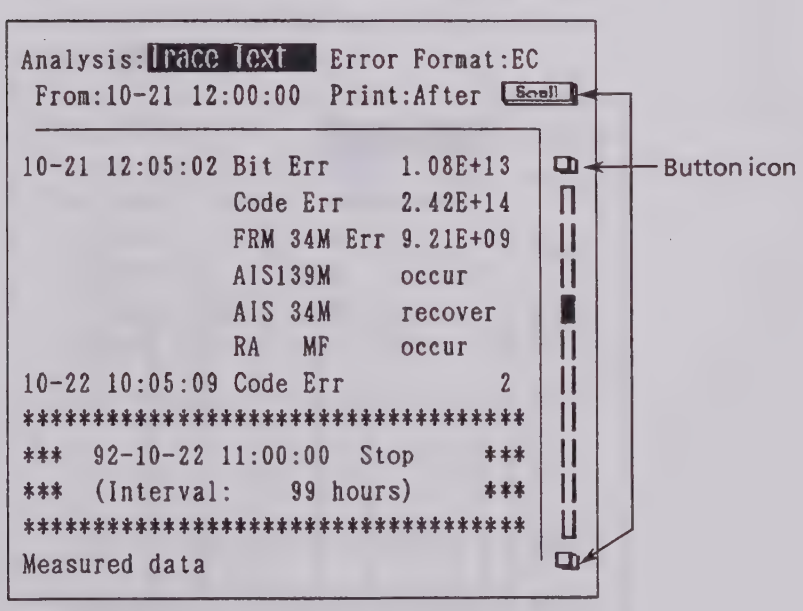


Fig. 4-8 Analysis:Trace Text Screen

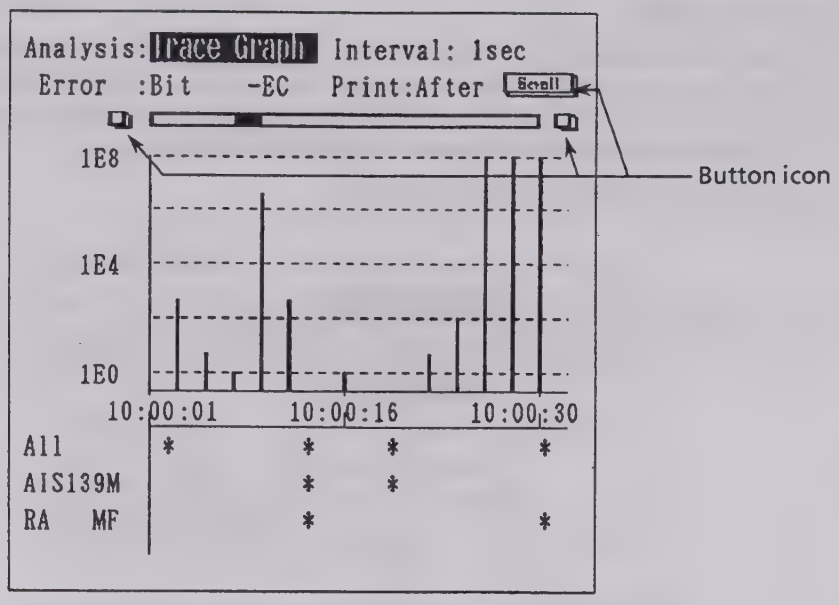


Fig. 4-9 Analysis:Trace Graph Screen

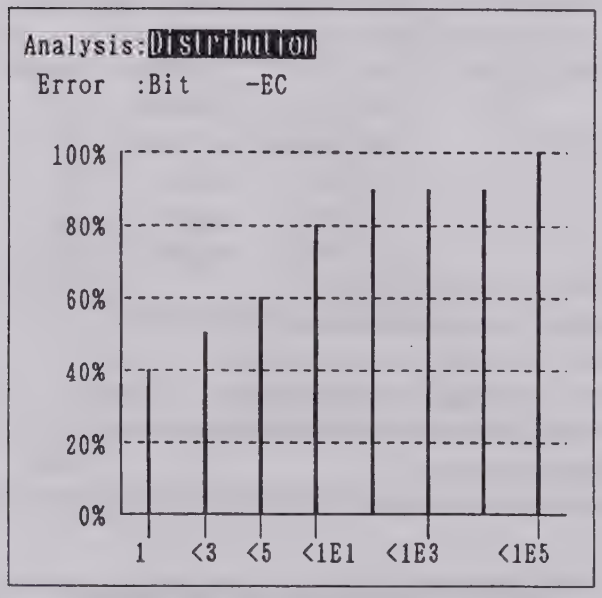


Fig. 4-10 Analysis:Distribution Screen

4.4.4 Setup screen

Use the setup screen to make a variety of settings accompanying measurements. The Setup screen has three subscreens. These subscreens are used to set the measurement conditions (Measure) that do not need to be changed frequently, printing conditions of the printer (Print), and local memory setting (Memory).

The subscreens of the Setup screen are as follows:

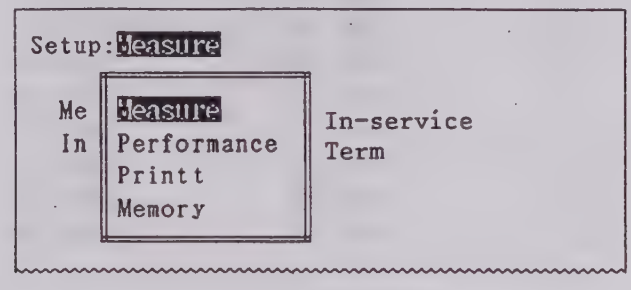


Fig. 4-11 Subscreen Menu of Setup Screen

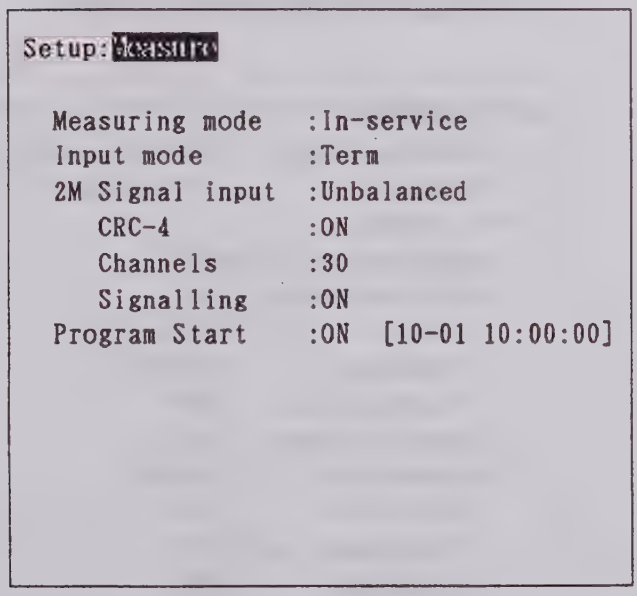


Fig. 4-12 Setup:Measure Screen

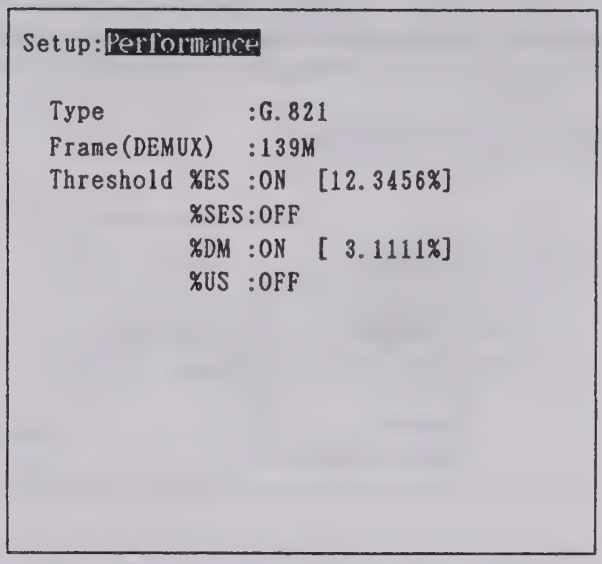


Fig. 4-13 Setup:Performance Screen

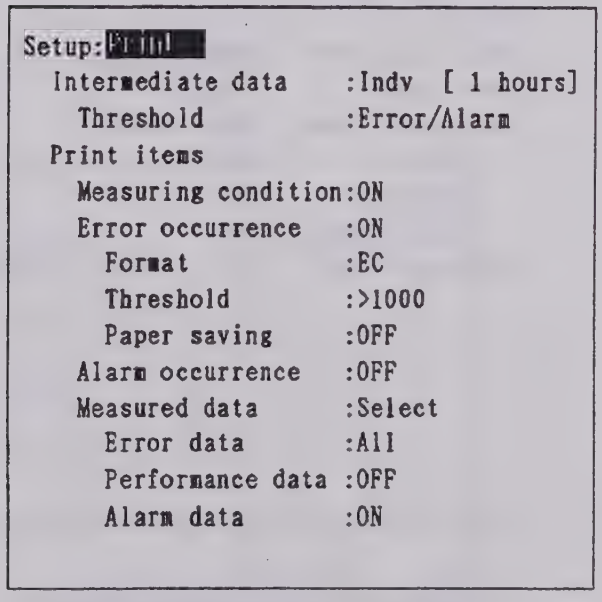


Fig. 4-14 Setup:Print Screen

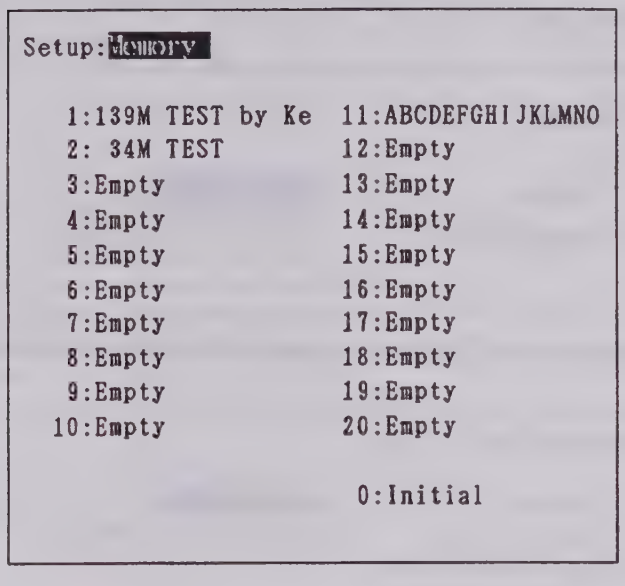


Fig. 4-15 Setup:Memory Screen

Note: *Contents displayed on the screens differ depending on the items set.*

4.4.5 System screen

Set the clock, buzzer, and external interface on the System screen.

The System screen has no subscreens.

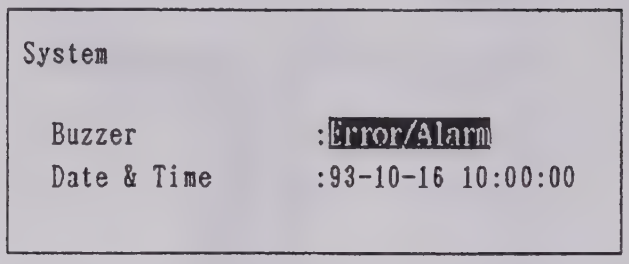


Fig. 4-16 System Screen (without External Interface Unit Installed)

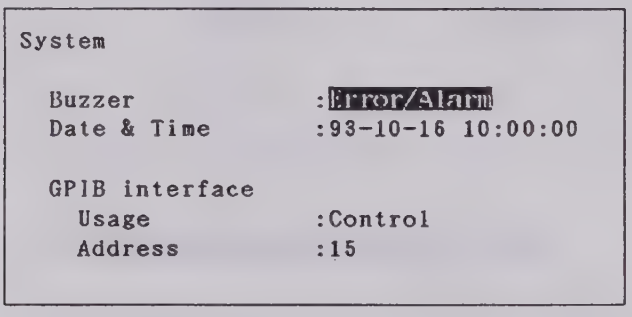


Fig. 4-17 System Screen (with External Interface Unit [GPIB] Installed)

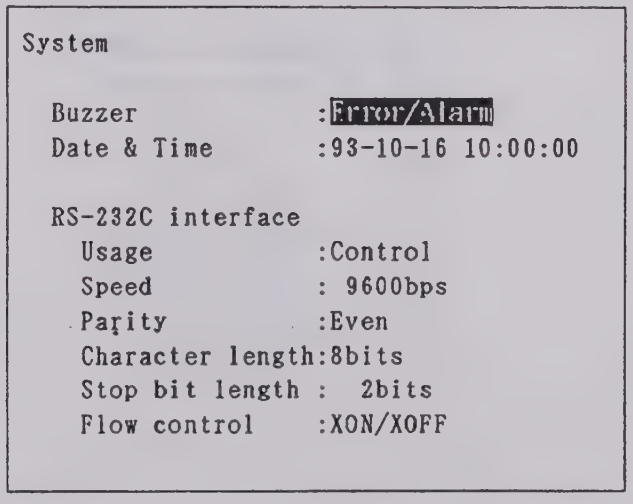


Fig. 4-18 System Screen (with External Interface Unit [RS-232C] Installed)

Note: *The screen display differs depending on the external interface unit installed.*

4.4.6 Selftest screen

Self-diagnosis of the MP1520B is performed on the Selftest screen.

The Selftest screen has no subscreens.

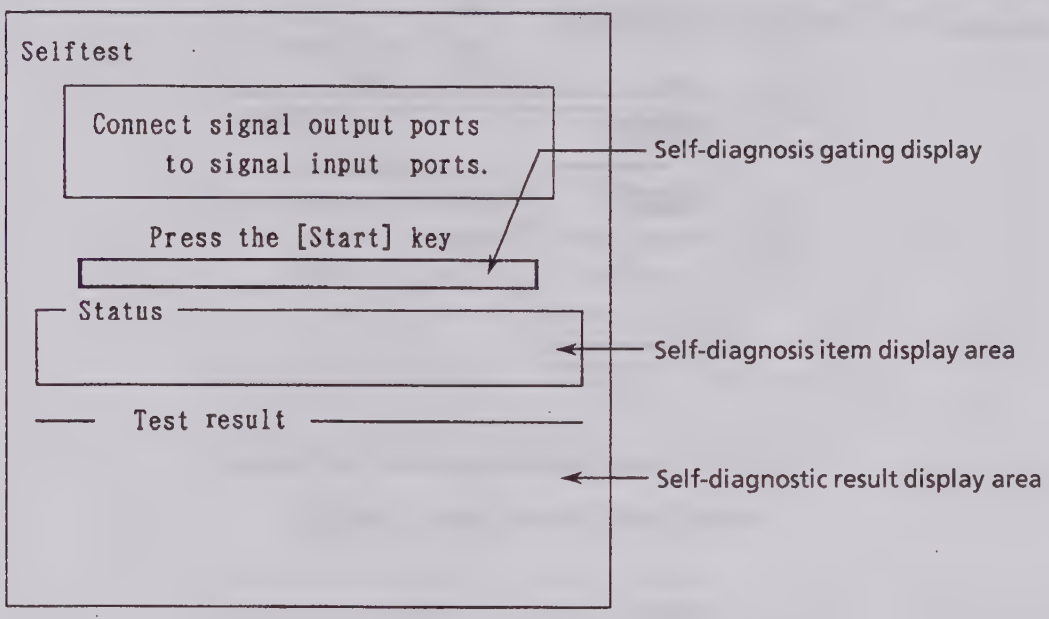


Fig. 4-19 Selftest Screen

4.4.7 Jitter screen

Settings relating to jitter measurement are conducted on the Jitter screen and the status indicated. The Jitter screen has 4 subscreens with which manual jitter generation/measurement (Manual), jitter tolerance measurement (Sweep mask), jitter transfer characteristic measurement (Transfer) and frequency-jitter amplitude characteristic measurement (Jitt/Freq) can be conducted.

The subscreens of the Jitter screen are as follows:

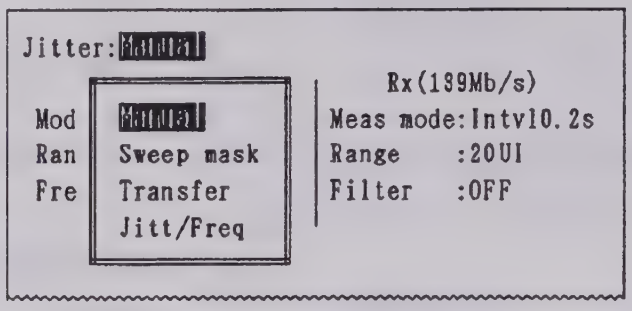


Fig. 4-51 Subscreen Menu of Jitter Screen

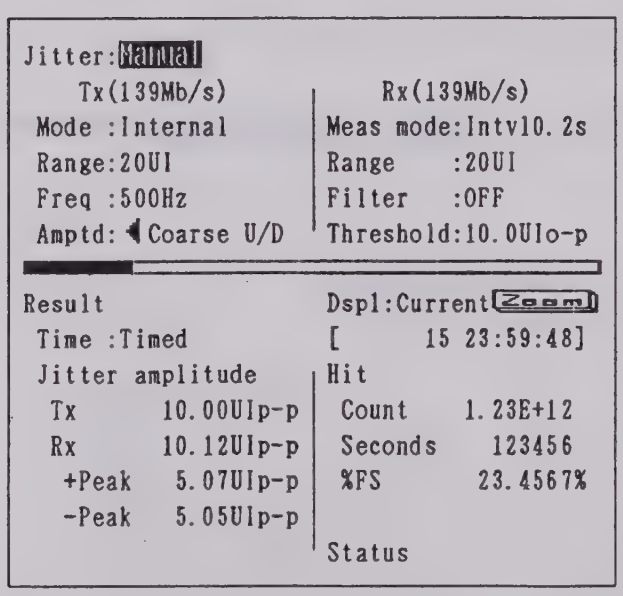


Fig. 4-52 Jitter:Manual Screen

Notes: • *The Jitter screen is displayed only when the jitter generation/measurement option is installed.*

• *The Jitt/Freq screen is displayed only when the frequency offset and jitter/generation/measurement options are installed.*

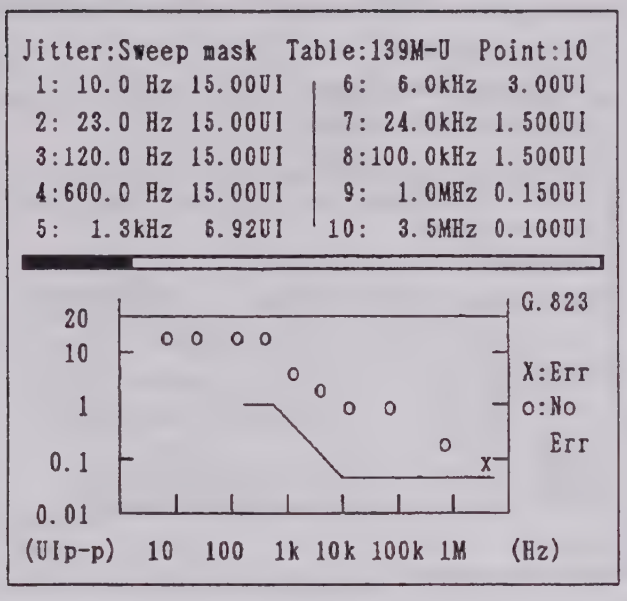


Fig. 4-53 Jitter:Sweep Mask Screen

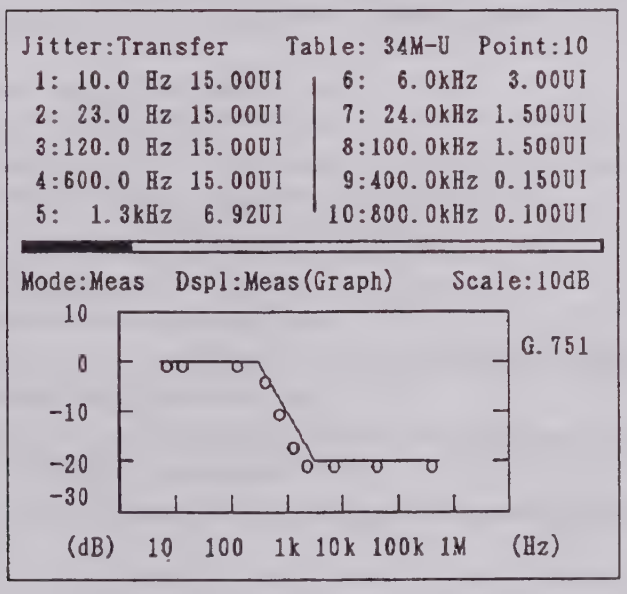


Fig. 4-54 Jitter:Transfer Screen

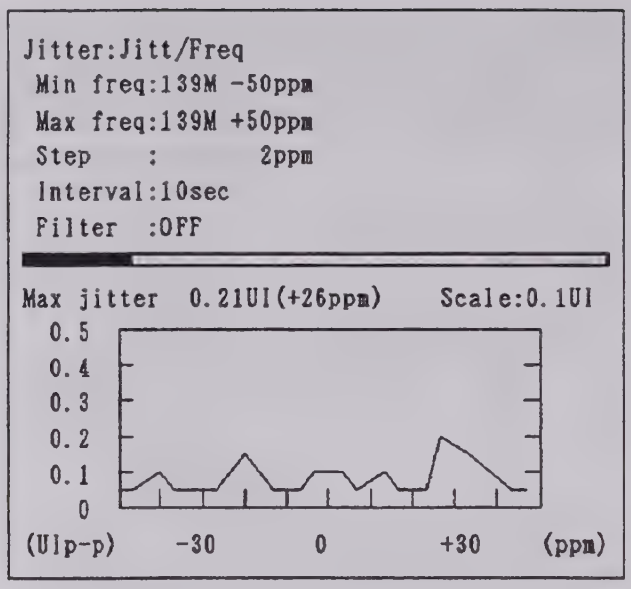


Fig. 4-55 Jitter:Jitt/Freq Screen

Note: *Contents displayed on the screens differ depending on the items set.*

4.5 Basic Screen Operations

4.5.1 Moving the cursor

This instrument has a function that enables item changes by positioning the cursor on the item to be changed.

Cursor keys can be used to move the cursor up, down, to the left, and to the right. However, the direction of movement may be restricted depending on the cursor position.

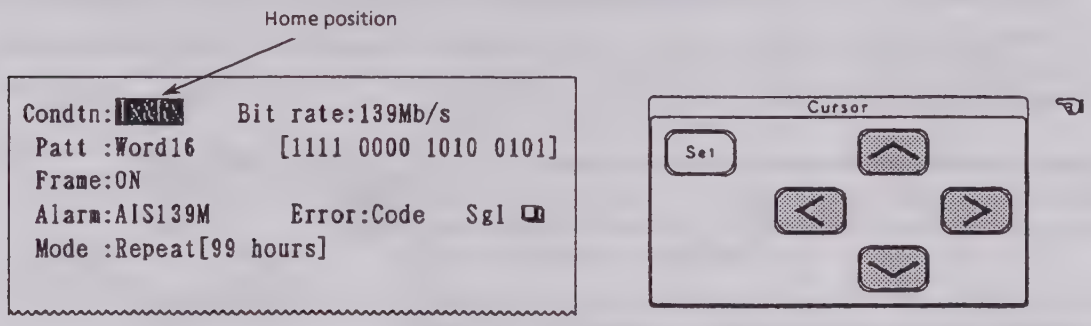


Fig. 4-20 Moving the Cursor

If the Menu key is used to switch a screen, the cursor is positioned on the top line on the screen. If the top line contains two or more items, the cursor is positioned on the item at the left end (home position).

Notes: *The cursor moves according to the following rules:*

1. *The cursor moves to the following settable items:*
   - *Items which follow the colon (:) of a label item (two or more items may follow the colon).*
   - *Zoom items when zoom is displayed on the Result screen*
   - *Button icons (there are* , Zoom , *and* Scroll)
   - *Original time display on the Analysis:Trace Graph screen*
   - *Alarm name display on the Analysis:Trace Graph screen*
   - *Memory display on the Setup:Memory screen*
2. *The ← key moves the cursor to the left. If there is no settable item on the left, the cursor moves to the item on the right end of the previous line.*
3. *The → key moves the cursor to the right. If there is no settable item on the right, the cursor moves to the item on the left end of the following line.*
4. *The ↑ and ↓ keys move the cursor up and down. The cursor always moves to the item on the left end of a line.*

4.5.2 Opening and closing the window

In principle, open the window to change the state of an item, or to set data for an item on which the cursor is positioned.

To open and close the window, perform the following key operations.

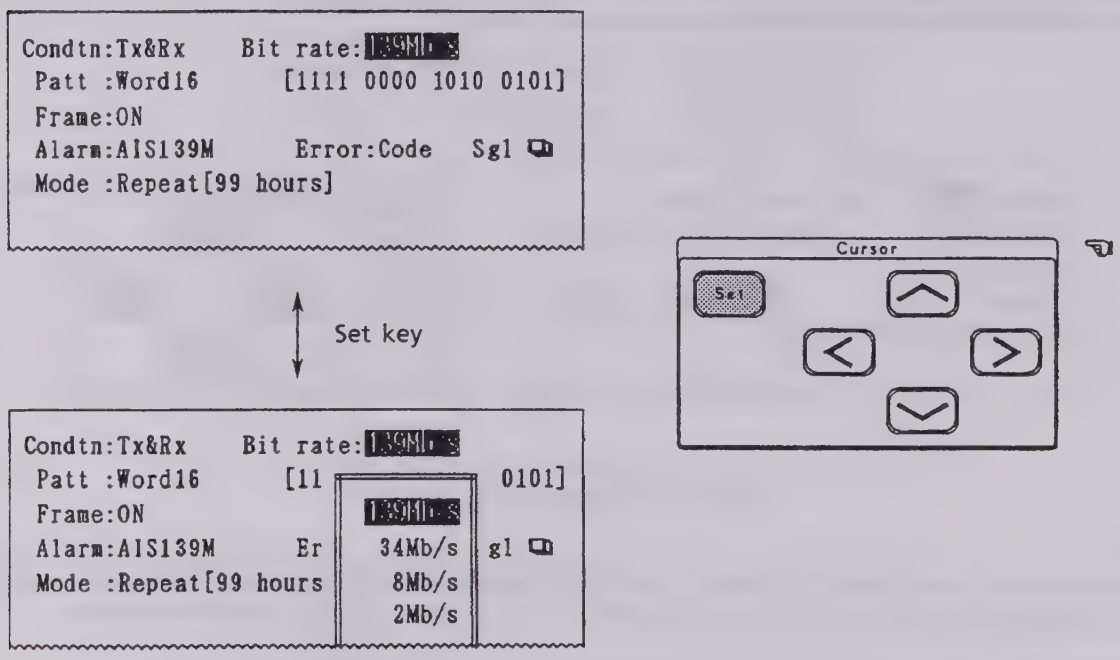


Fig. 4-21 Opening and Closing the Window

Move the cursor to the item to be changed, then press the Set key, and the window under the cursor is opened. When the Set key is pressed again, the window is closed.

***Note**: Closing the name entry window (explained later) is different from closing other windows.*

4.5.3 Method 1 of entering the data (window entry)

This instrument provides the following two methods to change a measuring instrument status:

- Setting on the window screen: Select a screen and change an item.
- Setting using button icons: Add an error, display the beginning or end of log data, and scroll text or a bar graph

This paragraph explains window entry.

In principle, use a window to enter data in this instrument. The set value becomes valid when the window is closed after selection terminates at window entries.

The following three methods are provided to enter data from windows according to data types:

Window entries	• Menu entry:	Displays all selectable items in the window, then use the window cursor to select an item.
	• Numerical entry:	Displays numbers in the window, then increase or decrease the numbers. Use the window cursor to specify the digit to be increased or decreased. Word data, date, and time are entered in the number entry format.
	• Name entry:	Displays characters that can be used for names in the window, then use the window cursor to select a character. This method is used by setting memory.

Setting methods are as follows:

(1) Menu entry

The menu entry displays all selectable items in the window, then uses the window cursor to select an item. If some selectable items cannot be displayed in the window, the menu can be switched.

This method is used for switching the main screen with the Menu key and calling the memory with the Memory key in addition to setting bit rate and selecting alarm insertion .

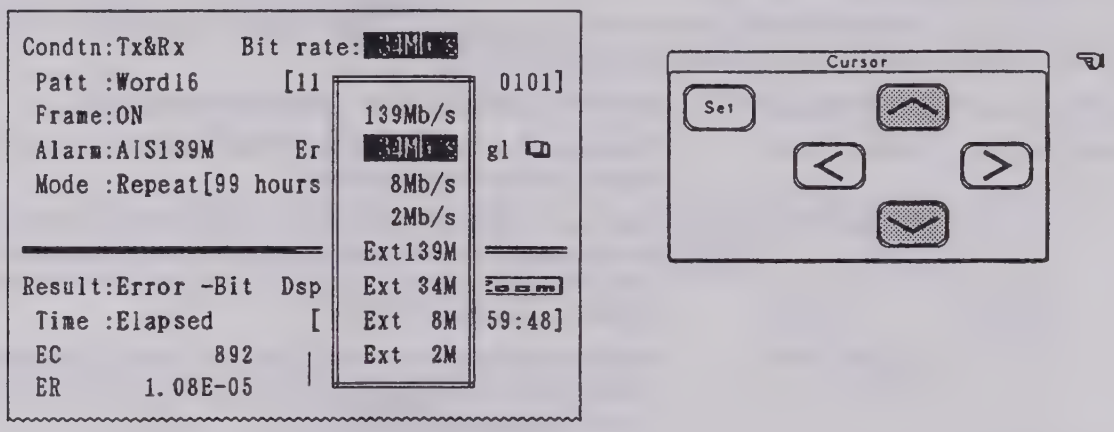
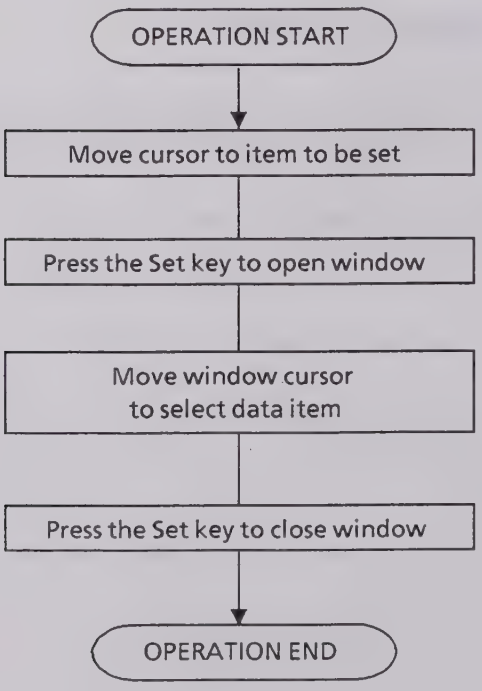


Fig. 4-22 Setting by Menu Entry (without Menu Switching)

To set by menu entry, perform the following key operations.


OPERATION START
Move cursor to item to be set
Press the Set key to open window
Move window cursor to select data item
Press the Set key to close window
OPERATION END

< Key operations >

key: Moves the window cursor up.

key: Moves the window cursor down.

If a menu can be switched, arrows (← / →) are displayed at the top of the window. To switch the menu, press the arrow key marked in the same direction.

The figures below show the screens displayed when the MUX/DEMUX option is mounted.

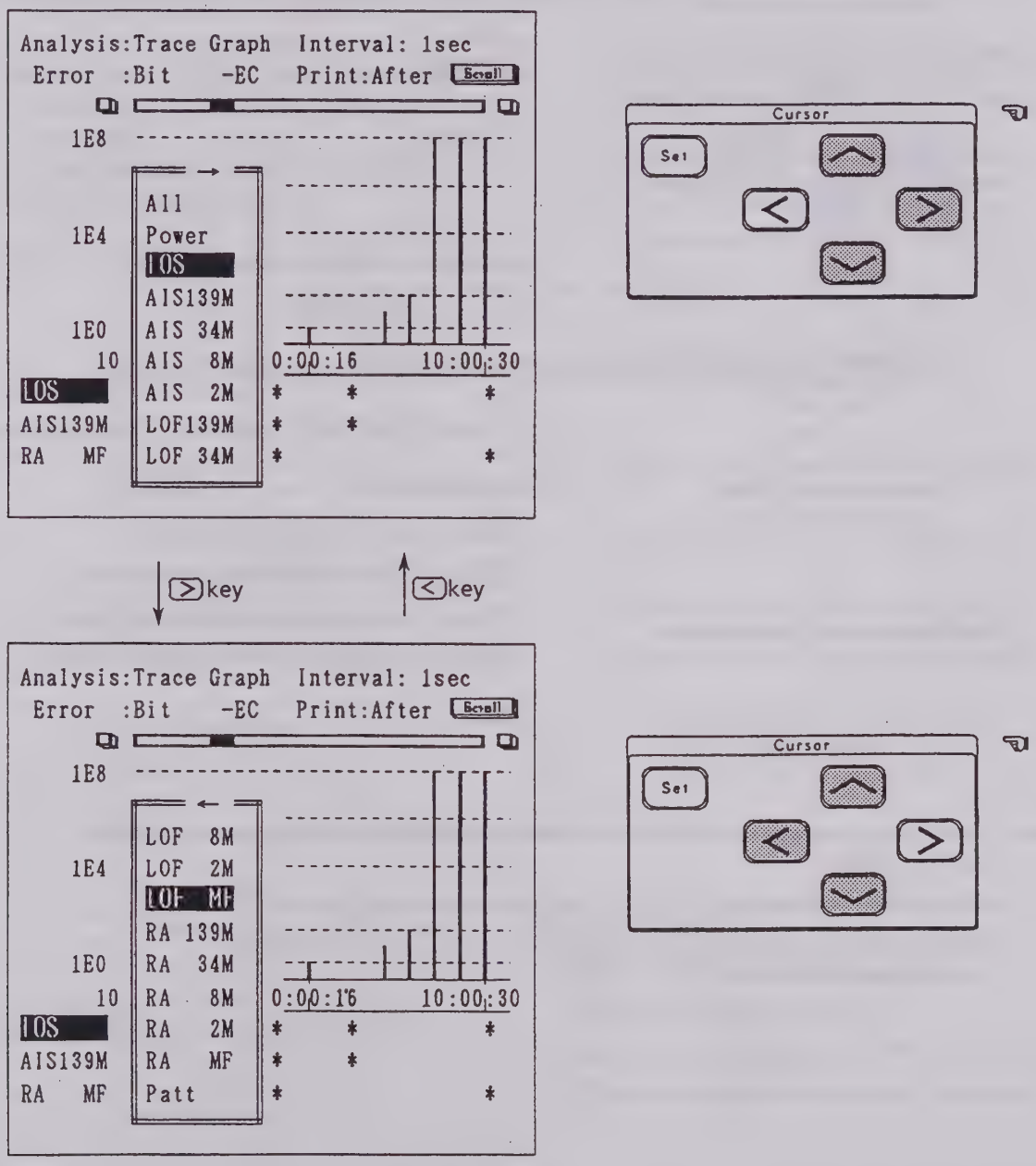
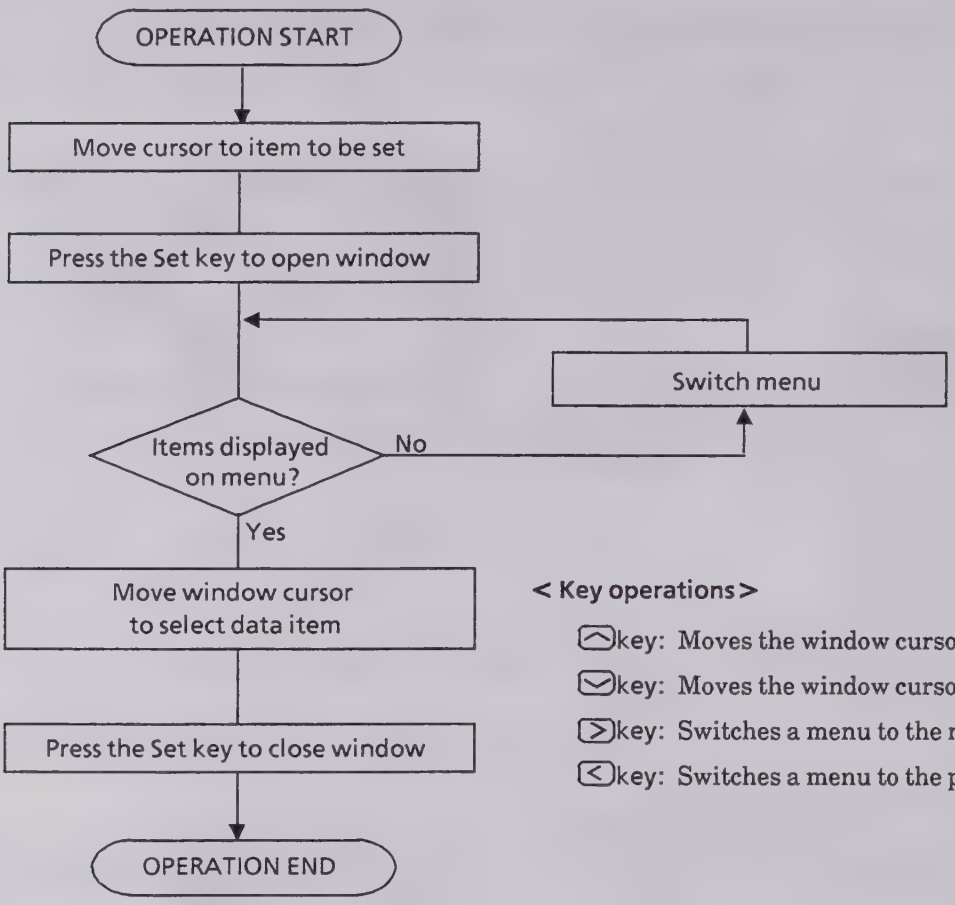


Fig. 4-23 Setting by Menu Entry (with Menu Switching)

To switch a menu, perform the following key operations.


OPERATION START
Move cursor to item to be set
Press the Set key to open window
Switch menu
Items displayed on menu?
No
Yes
Move window cursor to select data item
Press the Set key to close window
OPERATION END

< Key operations >

- ⌃ key: Moves the window cursor up.
- ⌄ key: Moves the window cursor down.
- > key: Switches a menu to the next page.
- < key: Switches a menu to the previous page.

Notes:

- *Items that cannot be selected under current measurement conditions are not displayed in the window.*
- *Use one of the arrow keys (← / →) at the top of the window to switch the menu.*
- *When the menu entry window is opened, the window cursor is positioned on the item currently set.*

(2) Numerical entry

The numerical entry displays the numbers in the window, then uses the window cursor to increase or decrease the numbers of the specified digit. This method is used for setting word data, date, and time in addition to the frequency offset (option) and threshold value settings.

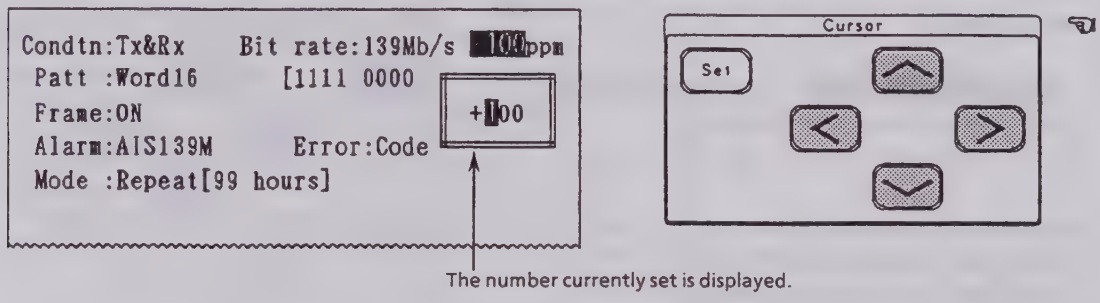
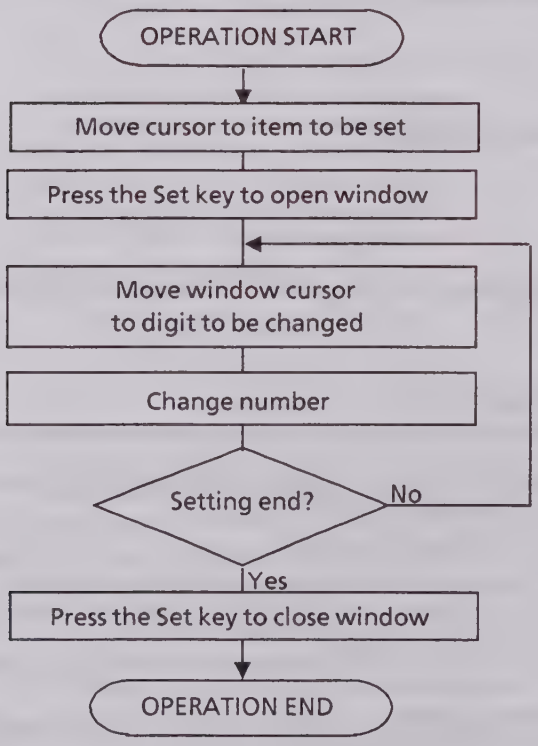


Fig. 4-24 Setting by Numerical Entry Window (Frequency Offset)

To enter a number, perform the following key operations.



< Key operations >

- key: Increases a number.
- key: Decreases a number.
- key: Moves the window cursor to the right.
- key: Moves the window cursor to the left.

Notes: • *An option 01 is required to set a frequency offset.*

- *When the number entry window is opened, the value currently set is displayed in the window. The window cursor is positioned over the digit on the left end. If a digit is signed, the window cursor is positioned on the sign.*
- *When dates and times are displayed, the number of displayed items may be restricted because of the display area size on the screen. However, year, month, date, hours, minutes, and seconds can all be specified at date and time setting.*
- *When using the ↑ or ↓ key to change a number, the screen scrolls up or down.*

(3) Name entry

The name entry displays characters that can be used for names in the window, then uses the window cursor to select a character. The memory name is set in this method.

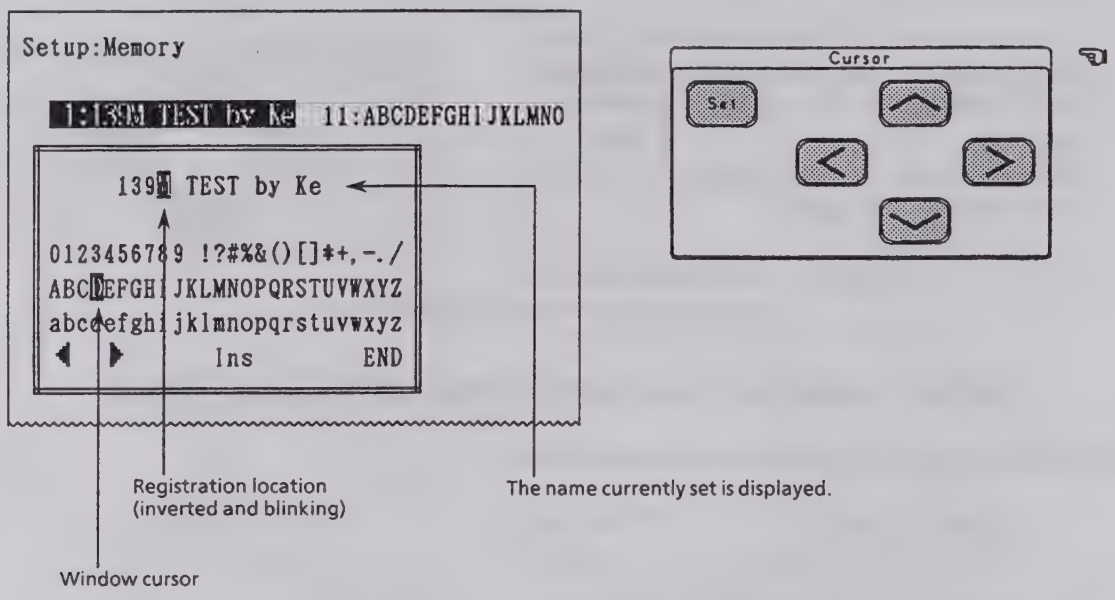


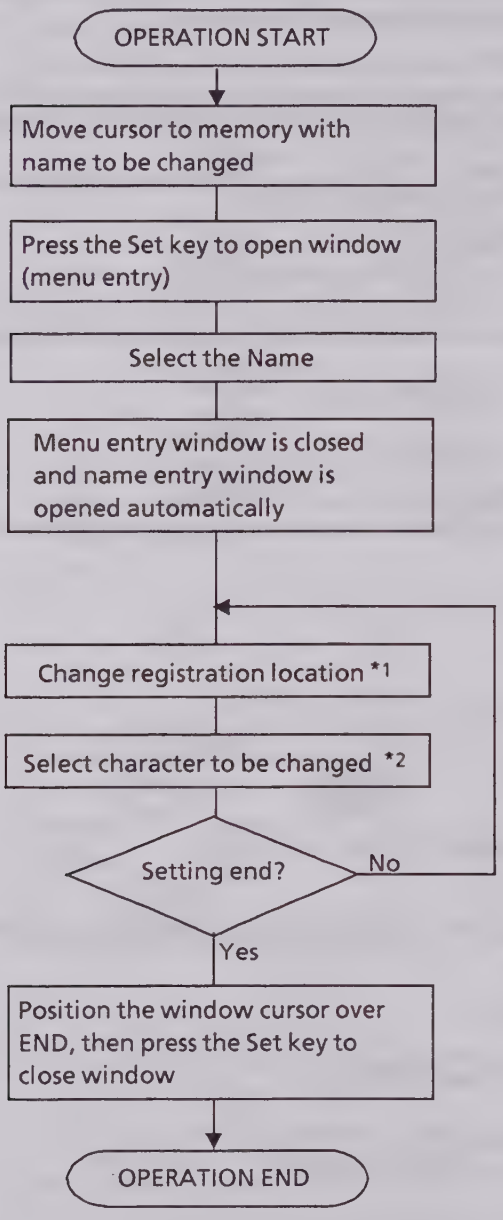
Fig. 4-25 Name Entry Window

The character string displayed on the bottom line of the window is for editing. The editing functions execute the operations listed in Table 3.

Table 3 Editing Functions

Editing character	Operation
◀	Moves the registration location one character to the left.
▶	Moves the registration location one character to the right.
BS	Deletes the character on the left of the registration location and moves the whole character string after the registration location one character to the left. This function also moves the registration location to the left.
Ins	Moves the character strings after the registration location one character to the right and makes the registration location blank.
END	Sets a registered character string as a name and closes the window.

To enter a name, perform the following key operations.


OPERATION START
Move cursor to memory with name to be changed
Press the Set key to open window (menu entry)
Select the Name
Menu entry window is closed and name entry window is opened automatically
Change registration location *1
Select character to be changed *2
Setting end?
No
Yes
Position the window cursor over END, then press the Set key to close window
OPERATION END

*1: Move the registration location (inverted and blinking part on the top line in the window) over the character to be changed. To move the registration location, position the window cursor over the arrow mark ◀ (move to the left) or ▶ (move to the right) in the window and press the Set key.

*2: Position the window cursor over the character to be changed and press the Set key.

< Key operations >

Set key: Registers and edits the character on which the window cursor is positioned.

key: Moves the window cursor up.

key: Moves the window cursor down.

key: Moves the window cursor to the right.

key: Moves the window cursor to the left.

Notes:
- *Up to 15 characters can be registered. If a name exceeding 15 characters is specified, the excess characters are deleted.*
- *A blank inserted using the 'Ins' editing character is assumed to be one character.*
- *When the cursor is moved to the memory and Name is selected on the Setup:Memory screen, the name entry window is opened.*

4.5.4 Method 2 of entering the data (button icon entry)

The button icons of this instrument can be used to set single error insertion, zoom display switching, and switching to scroll mode screen immediately. Use the Set key to execute a button icon.

There are three types of button icons:

< Button icons >

button	Executes an icon function, then returns to the original position. Set key: →
Zoom button	Changes a setting, then holds the state. Set key: Zoom → Zoom Set key: Zoom → Zoom
Scroll button	After the setting is changed, the button remains in the same status. Set key: Scroll → ▲Scroll▼ or ◄Scroll► Set key: ▲Scroll▼ or ◄Scroll► → Scroll

The following paragraphs explain how to set the buttons

(1) Setting the button

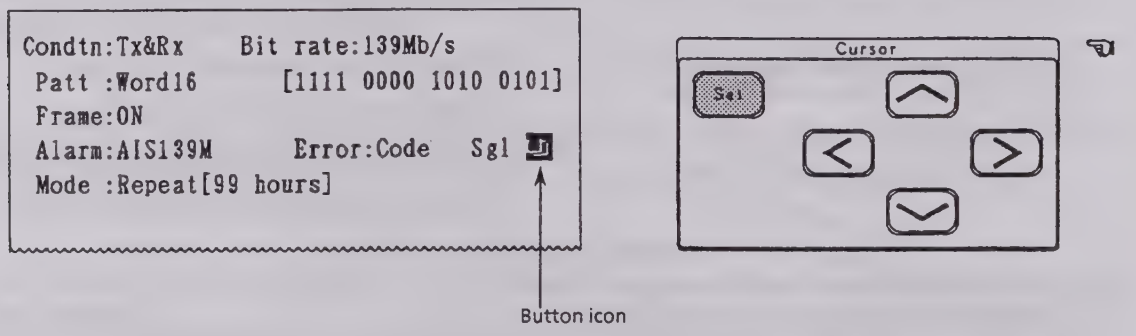
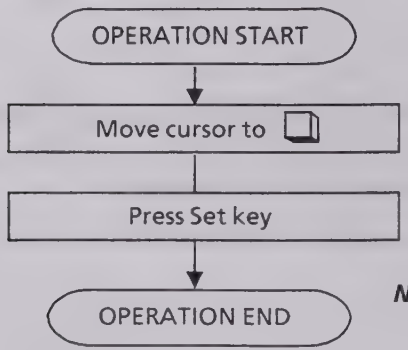


Fig. 4-26 Setting the Button

To set the button icon, perform the following key operations.



< Key operations >

Set key: Executes functions.

Note: *Use to insert a single error (Condtn/Result screen) and set history data (Analysis:Trace Text or Analysis:Trace Graph screen) display location to head or end.*

(2) Setting the Zoom button

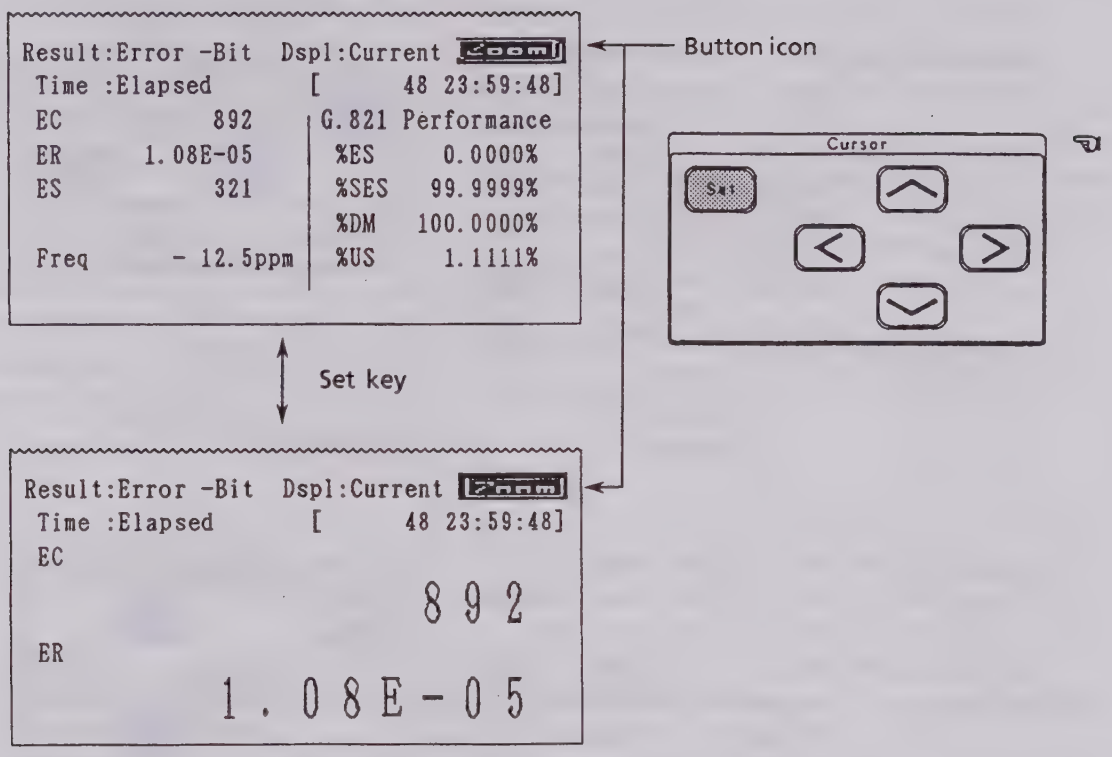
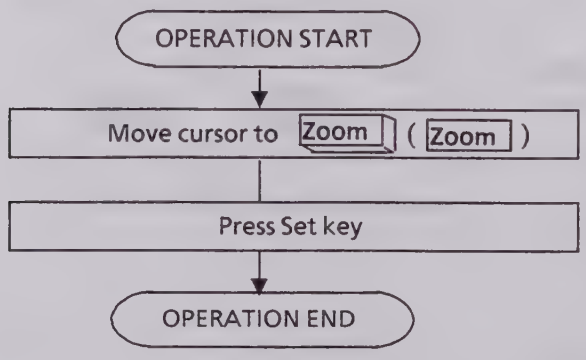


Fig. 4-27 Setting the Zoom Button

To set the zoom button icon, perform the following key operations.



< Key operations >

Set key: Executes functions.

(3) Setting the Scroll button

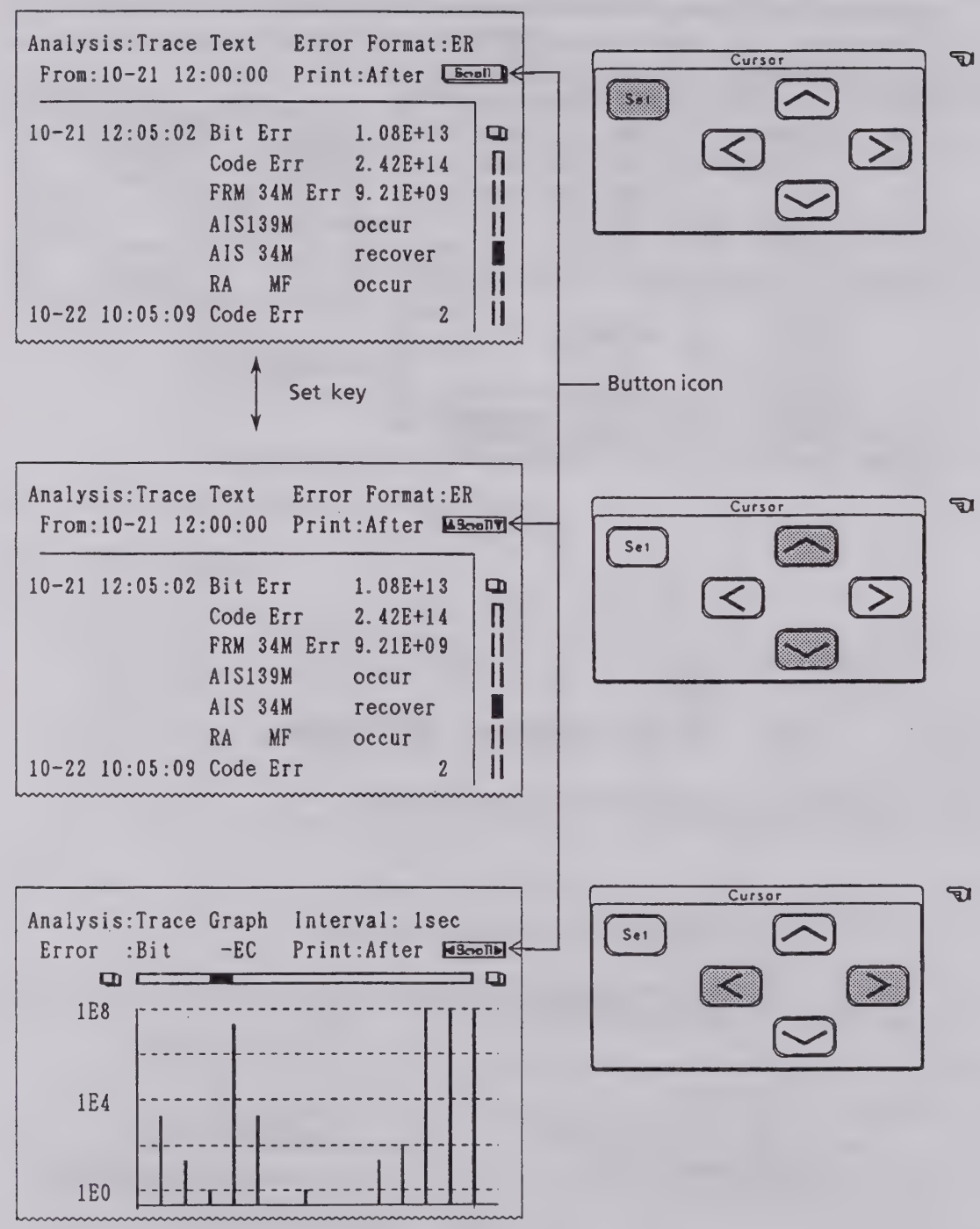
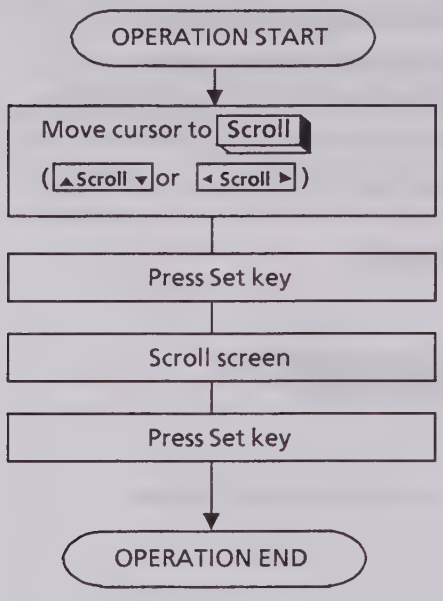


Fig. 4-28 Setting the Scroll Button

To set the Scroll button icon, perform the following key operations.



< Key operations >

Set key : Toggles between scroll state (button status: ▲Scroll▼ or ◄Scroll►) and non-scroll state (button status: Scroll).

⌒/⌒ key : Scrolls the Analysis: Trace text screen

</>key : Scrolls the Analysis: Trace graph screen

Notes: • *Use the* Scroll button to scroll the text (Analysis: Trace Text screen) or bar graph (Analysis: Trace Graph screen).

• *Scrolling continues while the button icon is pressed (*▲Scroll▼ or ◄Scroll►).

• *In the scroll state, the keys are effective in the directions shown by the arrows on the button icons.*

4.5.5 Calling the memory

Up to 20 setting conditions can be stored in the memory (local memory) of this instrument. Because this memory is backed up, it holds the setting conditions even if the power supply is turned off.

Storing the setting conditions into the memory is performed on the setup : Memory screen.

Calling the setting conditions from the memory is performed on any screen by using the Memory key anytime.

Call setting conditions from the memory as follows:

(1) When the Memory key is pressed, the Memory window is opened.

The window cursor is positioned on Cancel on the top.

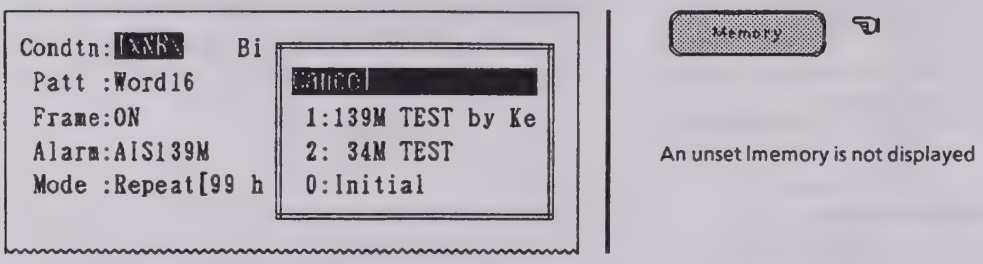


Fig. 4-29 Displaying the Memory Window

(2) Use the ↑ or ↓ key to move the window cursor and select the object memory.

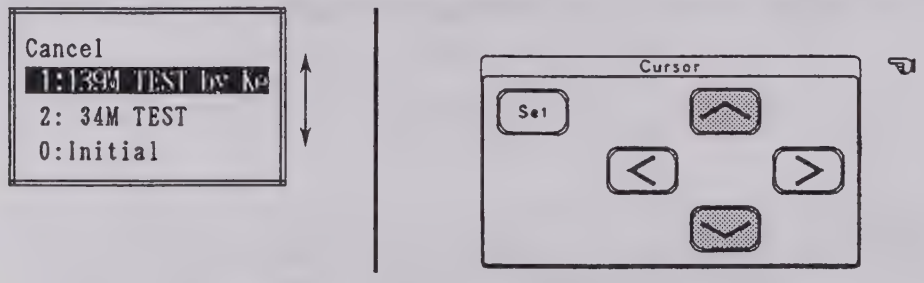


Fig. 4-30 Selecting the Memory Window

(3) When the Memory or Set key is pressed, the Memory window is closed and the setting condition is switched to the selected memory setting condition.

Notes:
- *The contents of the memory may be lost because of a failure or other cause.*
- *Data called from the memory is overwritten, and so previously set data cannot be restored*
- *To interrupt data calling from the local memory, select Cancel.*
- *If the memory cannot be displayed in the Memory window, arrows ←/→ are displayed on the top of the window. Press the appropriate cursor key to switch the menu.*
- *If no memory is set, only Cancel and 0:Initial are displayed in the Memory window.*
- *If 0:Initial is selected, settings return to the states set when the MP1520B was shipped from the factory.*

4.6 Basic Operation for Internal Printer

4.6.1 Setting the paper in the internal printer

Set the paper in the printer as follows:

Step	Procedure

1 Turn the printer fixing screw to the left and pull out the printer with the screw.

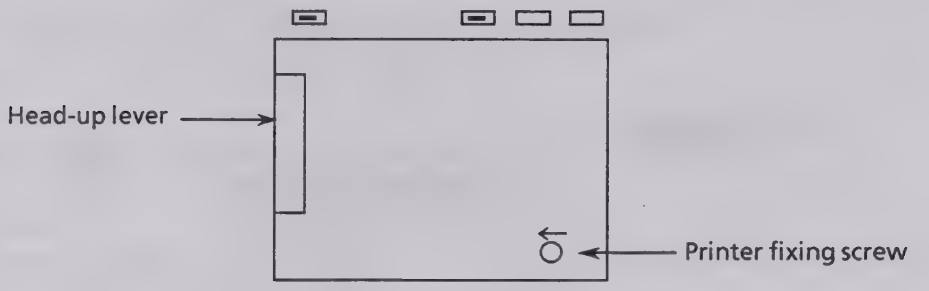


Fig. 4-31 Loosening the Printer Fixing Screw

2 Pull up the head-up lever.

3 Set the printing paper (rolled paper) as follows:

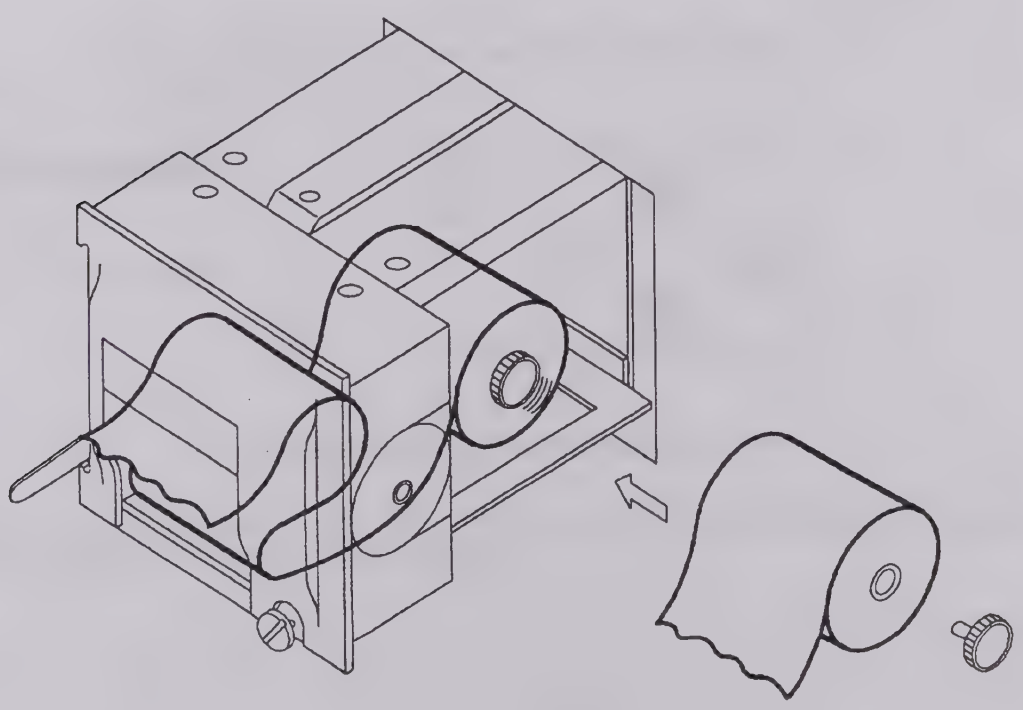


Fig. 4-32 Setting the Printing Paper

Step	Procedure

4 Push down the head-up lever.

5 Press the Paper Feed key until the end of the paper comes out.

6 When the paper is set correctly, push the internal printer into this instrument. Turn the printer fixing screw to the right to fix the printer.

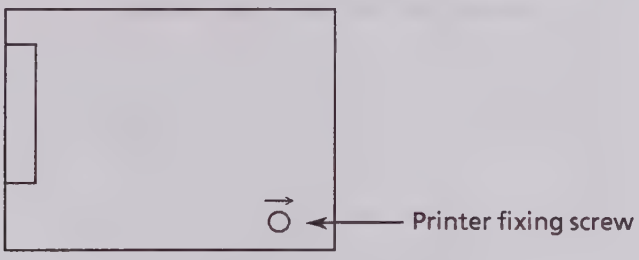


Fig. 4-33 Fixing the Printer Fixing Screw

Notes: • *The start of a new roll of paper is glued. Cut off the glued part before setting the paper, otherwise a printer fault will occur.*

• *If the paper is set in the reverse direction, data will not be printed correctly and a printer fault will occur. Set the paper correctly.*

4.6.2 Turning the internal printer on and off

This instrument can automatically print an alarm or error during a screen copy or a measurement. To print such an alarm or error to the internal printer, the internal printer should be switched on.

The Printer key LED on the front panel lights when the printer is on.

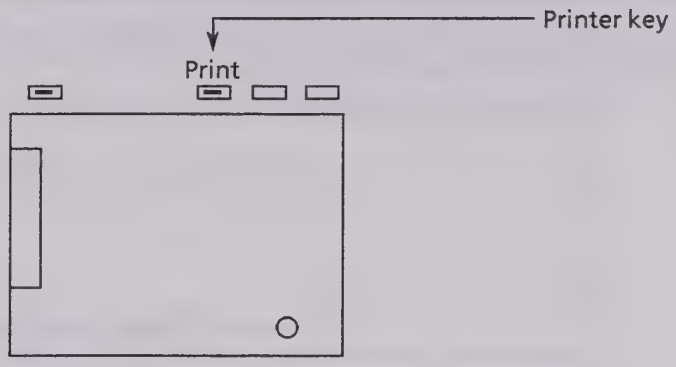


Fig. 4-34 Copy Key

Notes: ■ *If the printer cannot be switched on, check the following:*
- *Is the printer out of paper?*
- *Is the head-up lever lowered?*

■ *If a paper shortage occurs during printing, printing stops automatically.*

■ *Turning the internal printer on or off does not affect the operation of the external printer.*

4.6.3 Copying the screen

The contents of the currently displayed screen can be printed to the internal printer by pressing the Copy key on top of the printer.

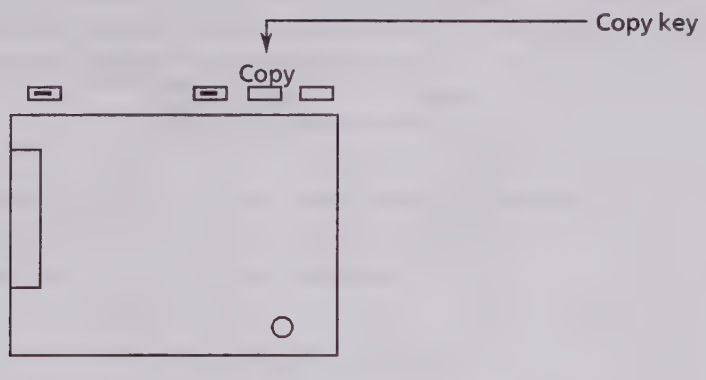


Fig. 4-35 Copy Key

Notes:
- *Because the resolutions of the screen and the printer are different, the display format of the screen and the printing format of the printer are also different.*
- *If an external interface is set in an external printer, use the Copy key to also print the contents of the screen to the external printer.*
- *To print data to the internal printer, the internal printer should be switched on.*
- *When graphic data is printed, horizontal lines may be shifted by about one dot.*

4.6.4 Feeding the paper

When the Paper Feed key on the top of the internal printer is pressed, paper is fed to the printer. When the Paper Feed key is held down, paper is fed continuously.

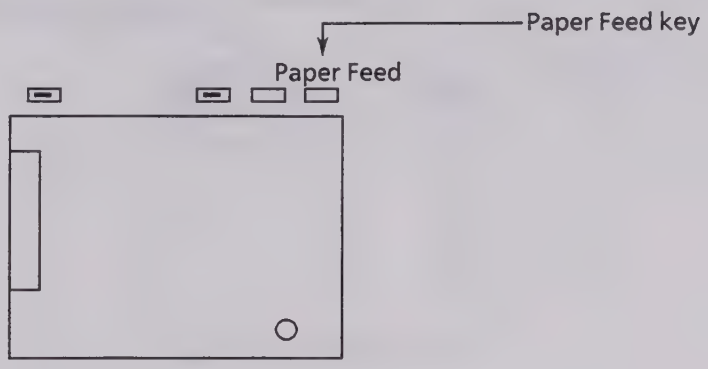


Fig. 4-36 Paper Feed Key

Notes:

- *The Paper Feed key operates whether the internal printer is on or off. If the Paper Feed key does not operate, check the following:*
  - *Is the printer out of paper?*
  - *Is the head-up lever lowered?*
- *The Paper Feed key does not feed the paper in an external printer. To feed the paper in an external printer, use the Feed key on the external printer.*

4.7 Other Operations

4.7.1 Starting and stopping a measurement

Basically, use the Start/Stop key to start and stop a measurement of this instrument. The LED above the Start/Stop key indicates the measurement state. (The LED is on while a measurement is being performed.) When the Start/Stop key is pressed while the LED is off, a measurement starts. When the Start/Stop key is pressed while the LED is on, the measurement stops.

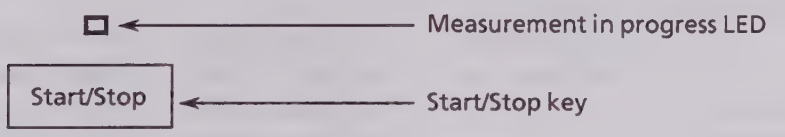


Fig. 4-37 Start/Stop Key and Measurement in progress LED

Notes:

- *In addition to the case in which the Start/Stop key is pressed while the LED is off, a measurement also starts in the following cases:*
  - *A programmable start is set, and a measurement start time set in the program occurs.*
  - *A repeat measurement is set, and a new measurement starts.*
  - *A set measurement condition is changed during a measurement.*
  - *The power supply is turned on.*
- *In addition to the case in which the Start/Stop key is pressed while the LED is on, a measurement also stops in the following cases:*
  - *A measurement cycle is set, and the set measurement cycle ends after a measurement starts (when repeat measurement is set, the next measurement starts after the end of this measurement).*
  - *A set measuring condition is changed during a measurement (the next measurement starts after the end of this measurement).*
- *Also use the Start/Stop key to start and stop selftest.*

4.7.2 Resetting Alarm and Error LEDs

The Alarm and Error LEDs on the front panel of this instrument display alarm and error states. The Power Fail and Rx LEDs of the Alarm and Error LEDs have a history function. A Power Fail or Rx LED displays a current alarm or error in red and a past alarm or error in orange. The orange LED goes off when the next measurement ends. It can also be turned off by pressing the History Reset key during a measurement.

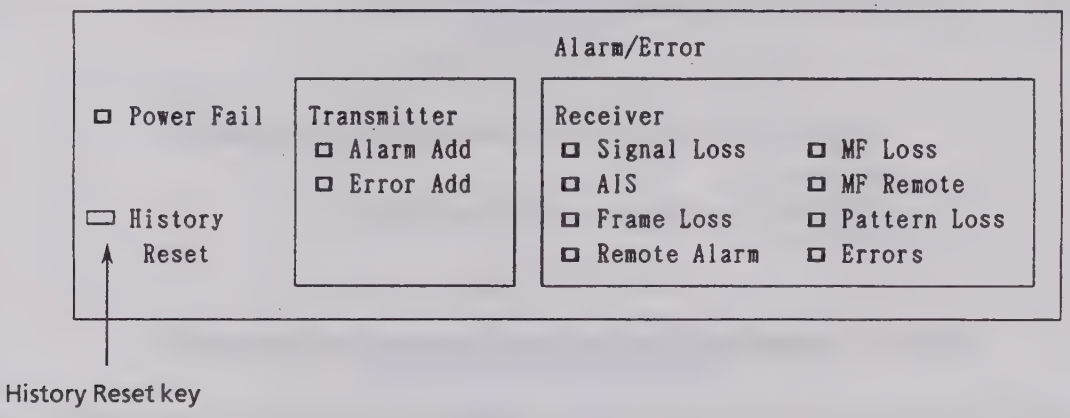


Fig. 4-38 Alarm and Error LEDs and History Reset Key

Note: *Pressing the History Reset key only turns off an orange LED. It does not turn off a red LED.*

4.7.3 Remote and local operations

This instrument can be operated remotely with the external interface unit.

When this instrument power is turned on, the device can be operated from the front panel. This is the local state. When the external interface is used to connect this instrument and the controller, this instrument can be controlled from the controller. This is the remote state. In the remote state, the Remote LED lights, and this instrument cannot be operated from the front panel. Only the Local key is valid. When the Local key is pressed, the Remote LED goes off, then this instrument can be operated from the front panel.

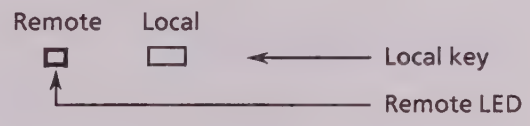


Fig. 4-39 Local Key and Remote LED

Note: *If LLO (local lockout) is received from the controller in the remote state, the MP1520B cannot be switched to the local state by pressing the Local key.*

4.7.4 Locking the panel

In the local state, this instrument operations from the front panel can be inhibited to prevent a measurement being stopped or settings being changed accidentally. This is called the panel locked state. When the Panel Lock key on the front panel is pressed, this instrument enters the panel locked state. When the Panel Lock key is pressed again, this instrument is released from the panel locked state.

When this instrument is in the panel locked state, the LED on the Panel Lock key is on.

Fig. 4-40 Panel Lock Key

SECTION 5
DETAILS OF OPERATIONS

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5.16.1 Functions 5-144
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5.17 Settings on the Jitter:Transfer Screen 5-148
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5.18 Settings on the Jitter:Jitt/Freq Screen 5-154
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5.18.3 Display condition setting 5-158

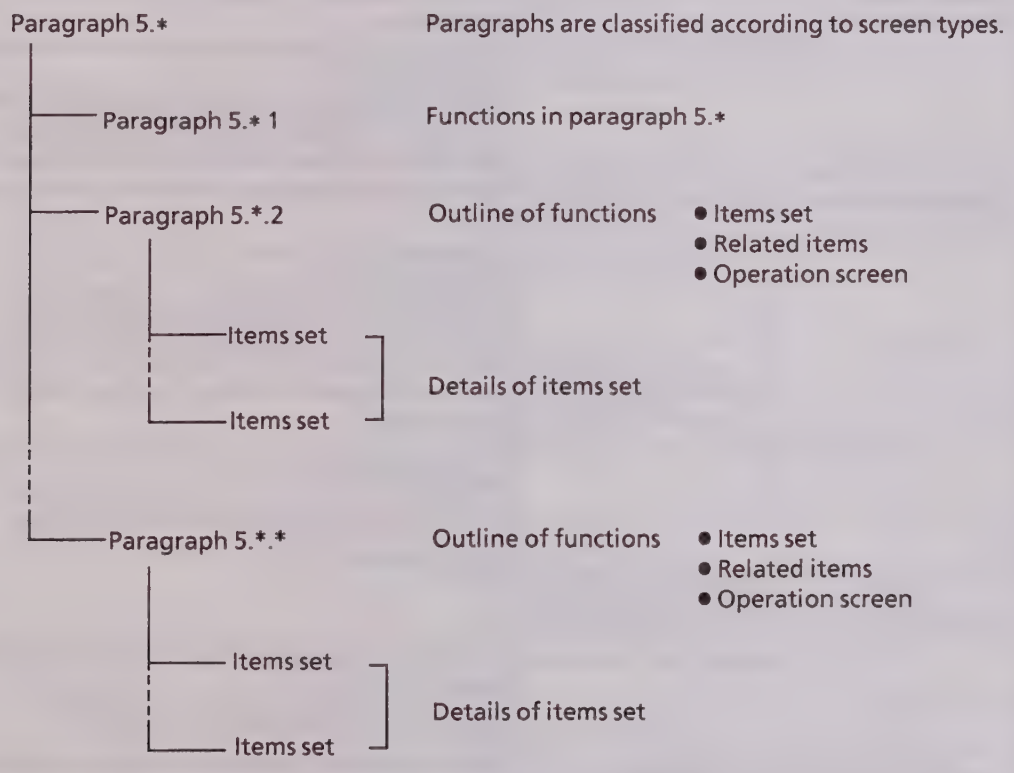
SECTION 5
DETAILS OF OPERATIONS

5.1 General

Paragraphs 5.2 to 5.13 explain in detail how to operate the MP1520B, as shown in the functional configuration diagrams below.

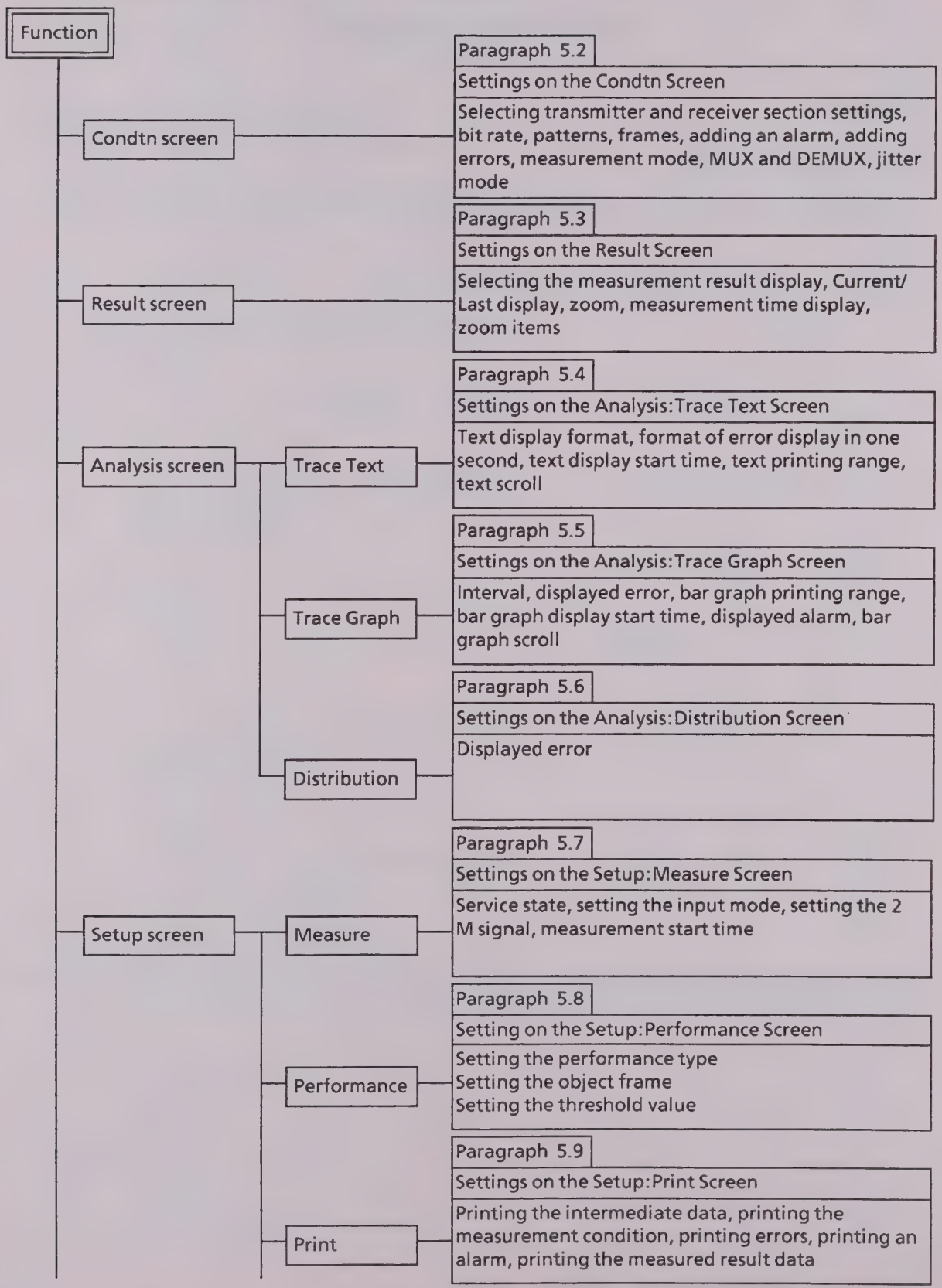
Paragraphs 5.2 to 5.11 explain the items on the various screens, based on the format below. There are no settings on the screen in paragraph 5.12 and paragraph 5.13.

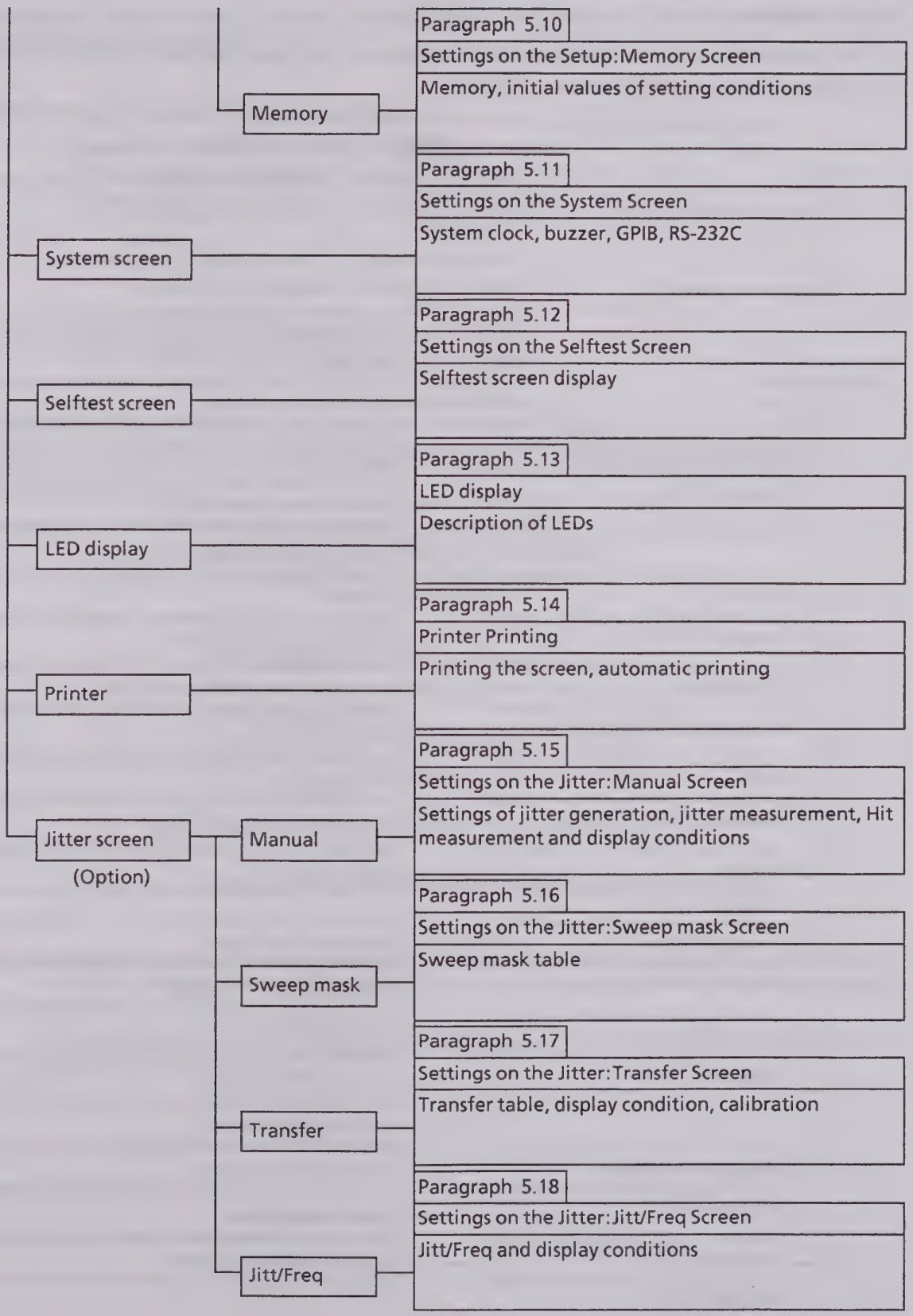
[Format] The paragraph hierarchy and contents are as follows:



A setting range may be limited or some items may not be settable, depending on the setting and option states. Limitations are explained in the notes on settable items.

[Function configuration diagram]


Function
Condtn screen
Paragraph 5.2
Settings on the Condtn Screen
Selecting transmitter and receiver section settings, bit rate, patterns, frames, adding an alarm, adding errors, measurement mode, MUX and DEMUX, jitter mode
Result screen
Paragraph 5.3
Settings on the Result Screen
Selecting the measurement result display, Current/Last display, zoom, measurement time display, zoom items
Analysis screen
Trace Text
Paragraph 5.4
Settings on the Analysis:Trace Text Screen
Text display format, format of error display in one second, text display start time, text printing range, text scroll
Trace Graph
Paragraph 5.5
Settings on the Analysis:Trace Graph Screen
Interval, displayed error, bar graph printing range, bar graph display start time, displayed alarm, bar graph scroll
Distribution
Paragraph 5.6
Settings on the Analysis:Distribution Screen
Displayed error
Setup screen
Measure
Paragraph 5.7
Settings on the Setup:Measure Screen
Service state, setting the input mode, setting the 2 M signal, measurement start time
Performance
Paragraph 5.8
Setting on the Setup:Performance Screen
Setting the performance type
Setting the object frame
Setting the threshold value
Print
Paragraph 5.9
Settings on the Setup:Print Screen
Printing the intermediate data, printing the measurement condition, printing errors, printing an alarm, printing the measured result data

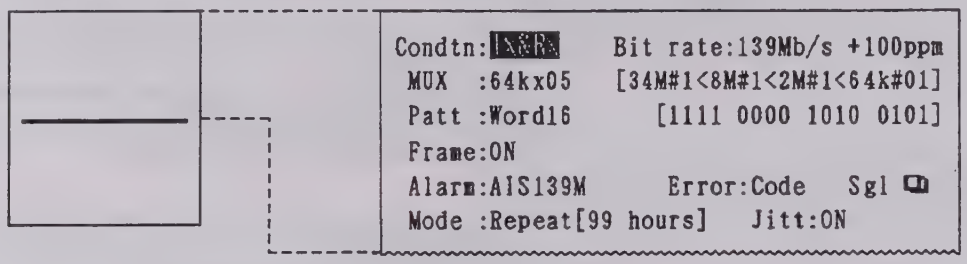

Memory
Paragraph 5.10
Settings on the Setup:Memory Screen
Memory, initial values of setting conditions
System screen
Paragraph 5.11
Settings on the System Screen
System clock, buzzer, GPIB, RS-232C
Selftest screen
Paragraph 5.12
Settings on the Selftest Screen
Selftest screen display
LED display
Paragraph 5.13
LED display
Description of LEDs
Printer
Paragraph 5.14
Printer Printing
Printing the screen, automatic printing
Jitter screen
(Option)
Manual
Paragraph 5.15
Settings on the Jitter:Manual Screen
Settings of jitter generation, jitter measurement, Hit measurement and display conditions
Sweep mask
Paragraph 5.16
Settings on the Jitter:Sweep mask Screen
Sweep mask table
Transfer
Paragraph 5.17
Settings on the Jitter:Transfer Screen
Transfer table, display condition, calibration
Jitt/Freq
Paragraph 5.18
Settings on the Jitter:Jitt/Freq Screen
Jitt/Freq and display conditions

5.2 Settings on the Condtn Screen

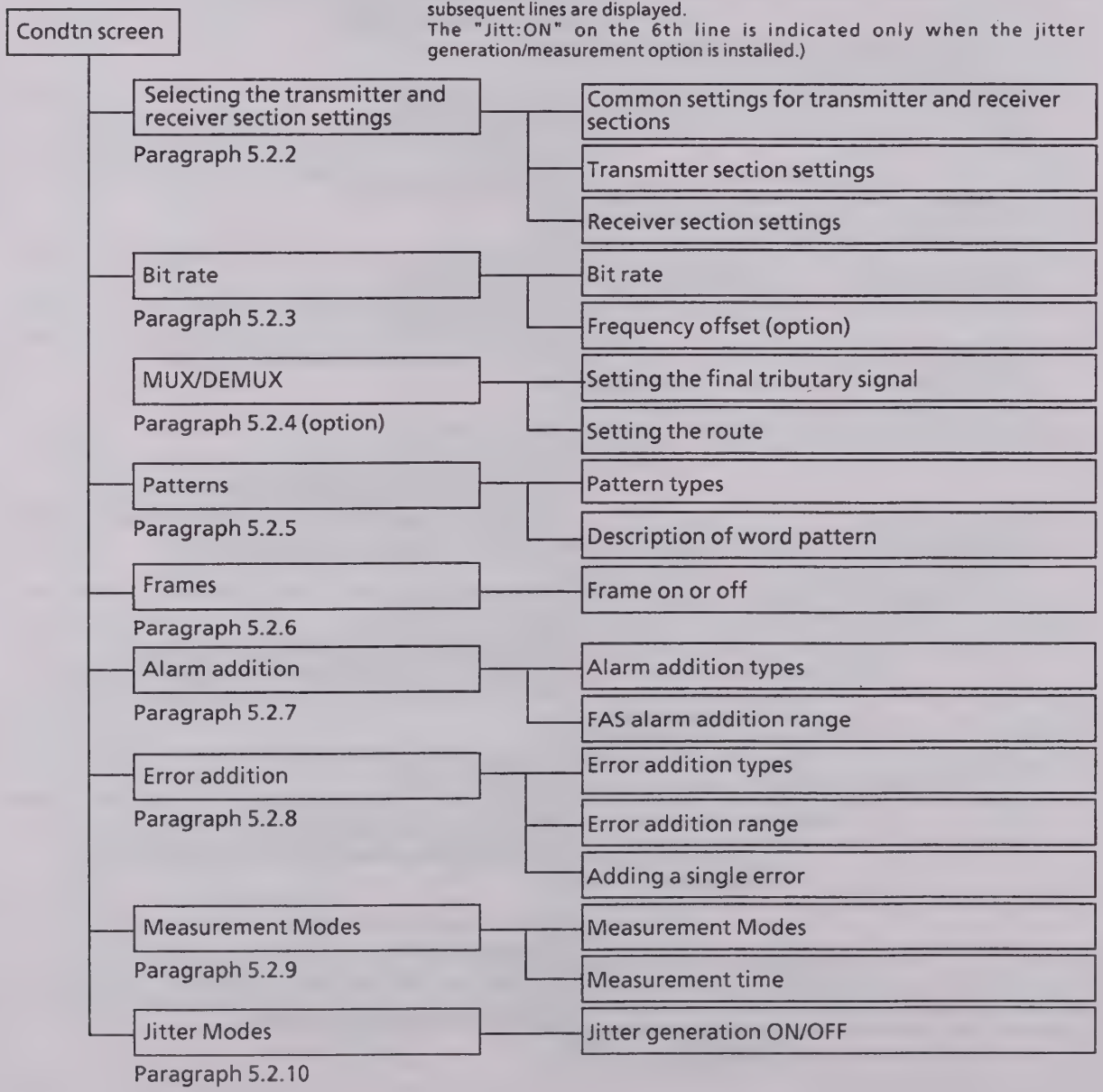
5.2.1 Functions

The Condtn screen is used to set the measurement conditions of the transmitter and receiver sections.

The Condtn screen and setting items are as follows:



(The second line is displayed only when the MUX or DEMUX option is installed. When the MUX or DEMUX option is not installed, the second (i.e. Patt) and subsequent lines are displayed.
The "Jitt:ON" on the 6th line is indicated only when the jitter generation/measurement option is installed.)



5.2.2 Selecting transmitter and receiver section settings

This paragraph explains how to switch between common settings and individual settings for the transmitter and receiver sections.

[Settable items] The following items can be set:

- The transmitter and receiver section settings

[Related items] This setting affects the following items:

- Bit rate
- Patterns
- Frames
- Adding an alarm
- Adding errors
- Measurement modes
- MUX and DEMUX (options)

(1) Selecting the transmitter and receiver section settings:

Switch between common settings and individual settings for the transmitter and receiver sections.

Setting ranges are as follows:

[Setting ranges]
Tx&Rx: Sets items for both the transmitter and receiver sections together.
Tx: Sets items for the transmitter section only.
Rx: Sets items for the receiver section only.

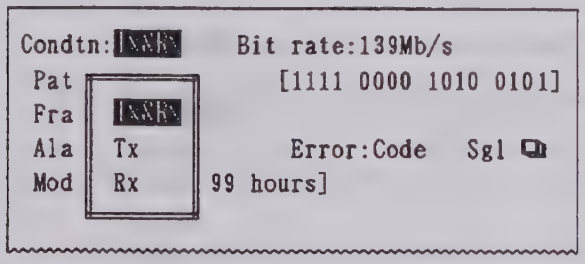


Fig. 5-1 Selecting the transmitter and receiver section settings

Notes: • *If individual settings for the transmitter and receiver sections are switched to common settings, the bit rate, pattern, frame, MUX or DEMUX set in the receiver section are set in the transmitter section.*

• *If the set values of these items conflict with the set values of other items, the other item values are changed to allowable values.*

5.2.3 Bit rate

This sets the bit rate of the transmitter and receiver sections.

[Settable items] The following items can be set:

- Bit rate
- Frequency offset

[Related item] The following item affects this setting:

- Option conditions: Whether a frequency offset option is installed.

(1) Bit rate:

Sets the bit rate of the transmitter and receiver sections.

Setting ranges are as follows:

[Setting ranges]

139 Mb/s: Sets a bit rate of internal 139 Mb/s.
34Mb/s: Sets a bit rate of internal 34 Mb/s.
8Mb/s: Sets a bit rate of internal 8 Mb/s.
2Mb/s: Sets a bit rate of internal 2 Mb/s.
Ext 139 M: Sets a bit rate of external 139 Mb/s.
Ext 34M: Sets a bit rate of external 34 Mb/s.
Ext 8M: Sets a bit rate of external 8 Mb/s.
Ext 2M: Sets a bit rate of external 2 Mb/s.
Receive: Uses a clock pulse regenerated from the signal input from the receiver section (this item can be set only when Condtn:Tx is selected).

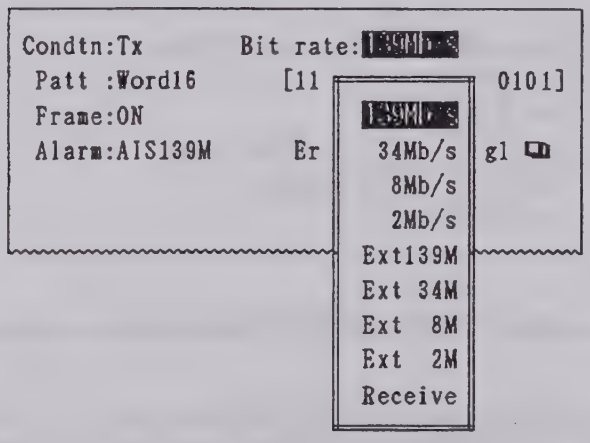


Fig. 5-2 Setting the Bit Rate

Notes: • *Initial values of patterns are set as follows according to set bit rates.*

Bit rate	Patt
139Mb/s	PRBS23
34Mb/s	PRBS23
8 Mb/s	PRBS15
2 Mb/s	PRBS15

- *If the set value of this item conflicts with the set values of other items, the other item values are changed to allowable values.*
- *If the bit rate of the receiver section is changed during a measurement, the measurement is restarted.*

(2) Frequency offset:

Sets the frequency offset of the transmitter section.

The setting range is as follows:

[Setting range] − 100 to + 100 ppm/step 1 ppm

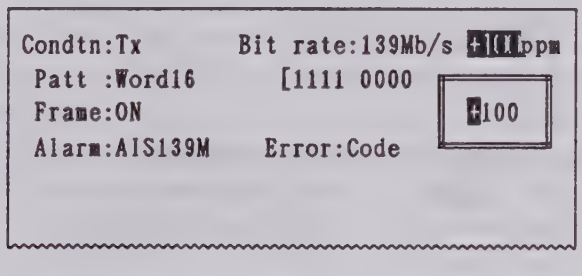


Fig. 5-3 Setting the Frequency Offset

Note: *This item can be set when the frequency offset option is installed and Condtn:Tx&Rx or Condtn: Tx is selected.*

5.2.4 MUX and DEMUX

This sets MUX (Multiplexer) of the transmitter section or DEMUX (Demultiplexer) of the receiver section.

[Settable items] The following items can be set:

- The final tributary signal
- Consecutive channels
- The route

[Related item] The following items affect this setting:

- Option condition: With or without the MUX option
- Setting the bit rate
- Setting the number of 2M channels

(1) The final Tributary signal:

This sets the final tributary signal of MUX (or DEMUX for the receiver section).

Setting ranges are as follows:

[Setting ranges]
OFF: Does not use the MUX or DEMUX function.
34M: Sets a bit rate of 34 Mb/s.
8M: Sets a bit rate of 8 Mb/s.
2M: Sets a bit rate of 2 Mb/s.
64k: Sets a bit rate of 64 kb/s

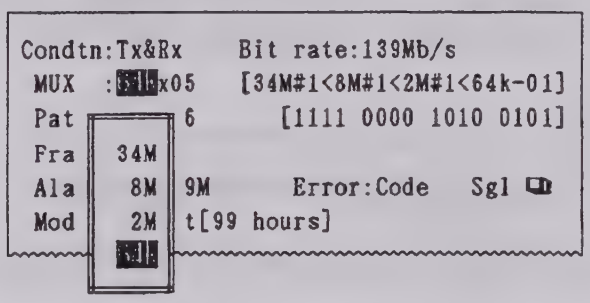


Fig. 5-4 The MUX final Tributary Signal

Notes:
- *When Condtn:Rx is selected, DEMUX: is displayed.*
- *Signals under the bit rate can be set.*
- *If the final tributary signal setting of DEMUX is changed during a measurement, the measurement is restarted.*
- *This item can be set when the MUX option is installed.*

(2) Setting consecutive channels:

Set the number of channels in which 64 kb/s test signals are to be inserted. Insert and measure the test signals in turn from the channels set at route setting. When the setting value of the channels is 30 or less, time slot 16 is skipped.

The setting range is as follows:

[Setting range] An integer from 1 to 31

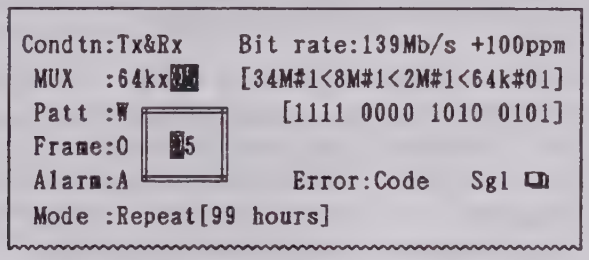


Fig. 5-5 Setting Consecutive Channels

Notes:

- *This item can be set when the final tributary signal is set to 64 kb/s.*
- *When the setting value of the 2M channels in the Setup: Measure screen, it is possible to set the consecutive channel to 31.*
- *If the set value of this item conflicts with the set values of other items, the other items are given non-conflicting values.*

(3) The route:

Sets the route of MUX (or DEMUX for the receiver section).

To set a route, specify a channel number in each MUX (DEMUX) step.

Setting ranges are as follows:

[Setting ranges] 1 to 4: Specifies the 34 Mb/s channel number.
1 to 4: Specifies the 8 Mb/s channel number.
1 to 4: Specifies the 2 Mb/s channel number.
1 to 30: Specifies the 64 Kb/s channel number.

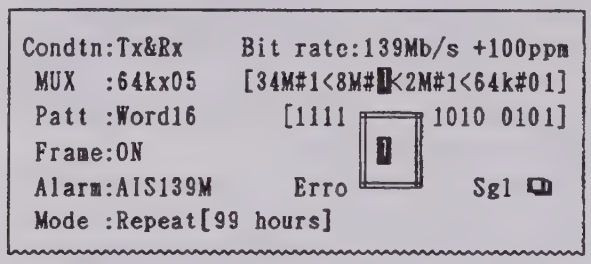


Fig. 5-6 Setting the MUX Route

Notes: • *If Condtn:Rx is set, DEMUX: is displayed.*

• *The following table lists the correspondence between the set 64 kb/s channel values and the time slots in which the test signals are inserted.*

Set channel No.	1	2	3	··	14	15	16	17	18	19	··	29	30
Signal insertion time slot	1	2	3	··	14	15	17	18	19	20	··	30	31

When the number of the consecutive channels is 30 or less, no signal is set in TS16 of the 64 kb/s signal.

• *The following table lists the correspondence between the maximum values of the 64 kb/s channels and the set value of the consecutive channels.*

Consecutive channel set value	1	2	3	4	··	28	29	30	31
Channel No. maximum value	30	29	28	27	··	3	2	1	1

• *The route display depends on the sign speed and tributary signal value.*

• *If a DEMUX route setting is changed during a measurement, the measurement is restarted.*

• *The MUX route can be set when the MUX option is installed.*

5.2.5 Patterns

This sets the generation and measurement patterns of the transmitter section.

[Settable items] The following items can be set:

- Pattern types
- Word pattern contents

(1) Pattern types:

Sets the patterns of the transmitter and receiver sections. When Word 16, Word 8, Word 4, or Word 2 is specified, use a word pattern to set the contents.

Setting ranges are as follows:

[Setting ranges]

PRBS23: Sets pseudorandom pattern $2^{23}-1$.
PRBS15: Sets pseudorandom pattern $2^{15}-1$.
PRBS11: Sets pseudorandom pattern $2^{11}-1$.
Word16: Sets a 16-bit word pattern.
Word 8: Sets an 8-bit word pattern.
Word 4: Sets a 4-bit word pattern.
Word 2: Sets a 2-bit word pattern.

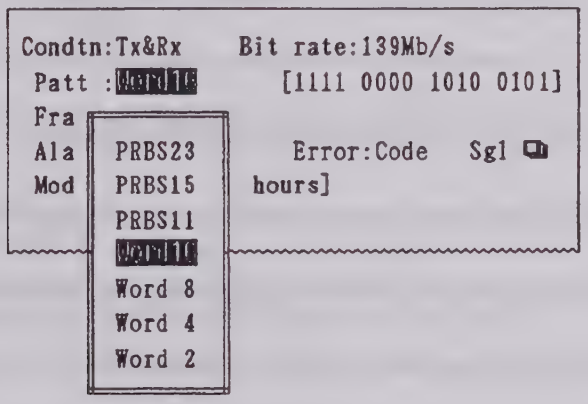


Fig. 5-7 Setting the Bit Rate

Notes:
- *If a bit rate is changed, the pattern becomes PRBS corresponding to the bit rate (see paragraph 5.2.3). This pattern can be changed.*
- *If a pattern of the receiver section is changed during a measurement, the measurement is restarted.*
- *If Condtn:Rx is selected during an in-service measurement, this item is not displayed.*

(2) Word pattern contents:

If pattern Word 16, Word 8, Word 4, or Word 2 is selected, this sets the word pattern of the specified word length.

The setting range is as follows:

[Setting ranges] 0000 0000 0000 0000 to 1111 1111 1111 1111: Setting using Word 16
10000 0000 to 1111 1111: Setting using Word 8
0000 to 1111: Setting using Word 4
00 to 11: Setting using Word 2

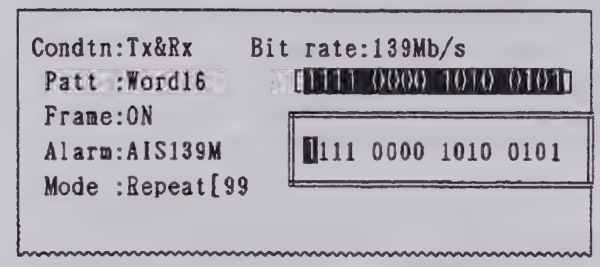


Fig. 5-8 Offset Setting the Word Pattern

Notes :
- *If a bit rate is changed, the pattern becomes PRBS corresponding to the bit rate. This pattern can be changed.*
- *If a word pattern of the receiver section is changed during a measurement, the measurement is restarted.*
- *When a word pattern is set, patterns not displayed become 0.*

5.2.6 Frames

This sets the frames of the transmitter and receiver sections.

[Settable items] The following item can be set:

- With or without the frame

(1) With or without frame:

Makes the setting without or with the frame for the transmitter and receiver sections.

Setting ranges are as follows:

[Setting ranges] OFF: Makes the setting without the frame.
ON: Makes the setting with the frame.

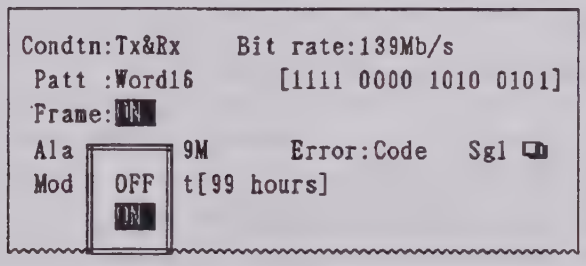


Fig. 5-9 Setting without or with the Frame

Notes:

- *If the set value of this item conflicts with the set values of other items, the other item values are changed to allowable values.*
- *If MUX or DEMUX (option) is ON, the setting without or with the frame is specified for the final tributary signal. The high order signals are always with the frame.*
- *If the frame setting of the receiver section is changed during a measurement, the measurement is restarted.*
- *For a 2 M frame, select ON or OFF of CRC-4, ON or OFF of Signaling, and 30 ch or 31 ch on the Setup:Measure screen as explained in paragraph 5.7.*
- *If Condtn:Rx is selected during an in-service measurement, this item is set to ON.*

5.2.7 Adding an alarm

This adds an alarm to the transmitter section.

[Settable items] The following item can be set:

- Alarm addition type
- FAS alarm addition range

[Related items] The following items affect this setting:

- The bit rate of the transmitter section
- The transmitter section frame
- The 2 M signaling
- MUX (option)

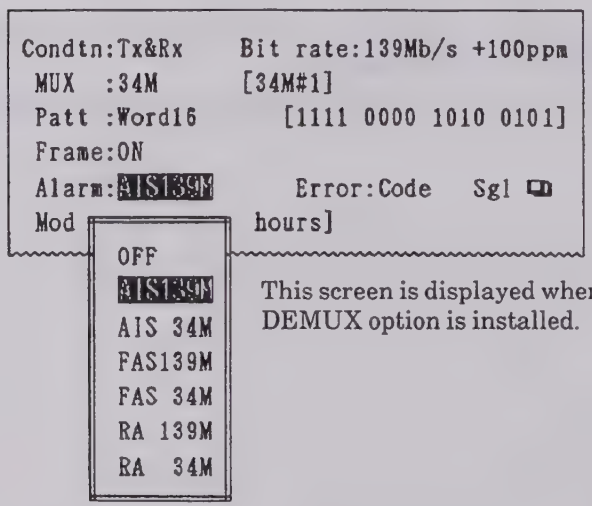
(1) Alarm addition type:

Sets the type of alarm to be added to the transmitter section.

Setting ranges are as follows:

[Setting ranges]

OFF:	No alarm is added.
AIS 139M:	Adds A13 to the 139 M signal.
AIS 34M:	Adds AIS to the 34 M signal.
AIS 8M:	Adds AIS to the 8 M signal.
AIS 2M:	Adds AIS to the 2 M signal.
FAS 139M:	Adds FAS alarm to the 139 M signal.
FAS 34M:	Adds FAS alarm to the 34 M signal.
FAS 8M:	Adds FAS alarm to the 8 M signal.
FAS 2M:	Adds FAS alarm to the 2 M signal.
RA 139M:	Adds a remote alarm to the 139 M signal.
RA 34M:	Adds a remote alarm to the 34 M signal.
RA 8M:	Adds a remote alarm to the 8 M signal.
RA 2M:	Adds a remote alarm to the 2 M signal.
RA MF:	Adds a multiframe remote alarm to the 2 M signal.



This screen is displayed when the MUX or DEMUX option is installed.

Fig. 5-10 Setting an Alarm Addition Type

Notes: • *Alarm addition types listed in the table below can be set.*

If the MUX or DEMUX option is not installed, the settings in the MUX OFF columns are adopted.

Transmit section bit rate	139 M/b					34 Mb/s			
MUX final tributary	MUX OFF	34 M	8 M	2 M	64 k	MUX OFF	8 M	2 M	64 k
AIS 139 M	○	○	○	○	○				
AIS 34 M		○	○	○	○	○	○	○	○
AIS 8 M			○	○	○		○	○	○
AIS 2 M				○	○			○	○
FAS 139 M	△	○	○	○	○				
FAS 34 M		△	○	○	○	△	○	○	○
FAS 8 M			△	○	○		△	○	○
FAS 2 M				△	○			△	○
RA 139 M	△	○	○	○	○				
RA 34 M		△	○	○	○	△	○	○	○
RA 8 M			△	○	○		△	○	○
RA 2 M				△	○			△	○
RA MF				▲	●			▲	●

Transmit section bit rate	8 Mb/s			2 Mb/s	
MUX final tributary	MUX OFF	2 M	64 k	MUX OFF	64 k
AIS 139 M					
AIS 34 M					
AIS 8 M	○	○	○		
AIS 2 M		○	○	○	○
FAS 139 M					
FAS 34 M					
FAS 8 M	△	○	○		
FAS 2 M		△	○	△	○
RA 139 M					
RA 34 M					
RA 8 M		○	○		
RA 2 M		△	○	△	○
RA MF		▲	●	▲	●

○: Can be set
△: Can be set when frame is on.
●: Can be set when signaling is on.
▲: Can be set when frame and signaling are both on.

• *This item can be set when Condtn:Tx&Rx or Condtn:Tx is selected.*

(2) FAS alarm addition rate:

Sets the rate at which the FAS alarm is to be added to the transmitter section.

Setting ranges are as follows:

[Setting ranges]
1/16: Inserts the FAS alarm at a rate of 1/16.
2/16: Inserts the FAS alarm at a rate of 2/16.
3/16: Inserts the FAS alarm at a rate of 3/16.
4/16: Inserts the FAS alarm at a rate of 4/16.

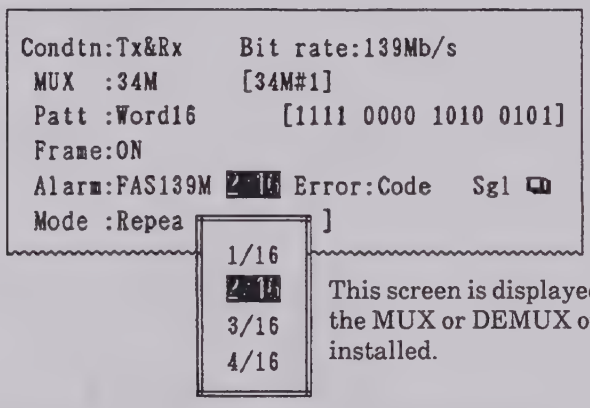


Fig. 5-11 Setting the FAS Alarm Addition Rate

Notes: • *If the alarm addition type is set to FAS, this item can be set.*
• *This item can be set when Condtn:Tx&Rx or Contn:Tx is selected.*

5.2.8 Adding errors

This adds one or more errors to the transmitter section.

[Settable items] The following items can be set:

- Error addition type
- Error addition rate
- Adding the single error

[Related items] The following items affect this setting:

- The bit rate of the transmitter section
- MUX (option)

(1) Error addition type:

Sets the type of error to be added to the transmitter section.

Setting ranges are as follows:

[Setting ranges]

OFF:	No error is added.
Bit 139M:	Adds a bit error to the 139M signal.
Bit 34M:	Adds a bit error to the 34M signal.
Bit 8M:	Adds a bit error to the 8M signal.
Bit 2M:	Adds a bit error to the 2M signal.
Code:	Adds a code error (HDB3 or CMI) to the interface signal.

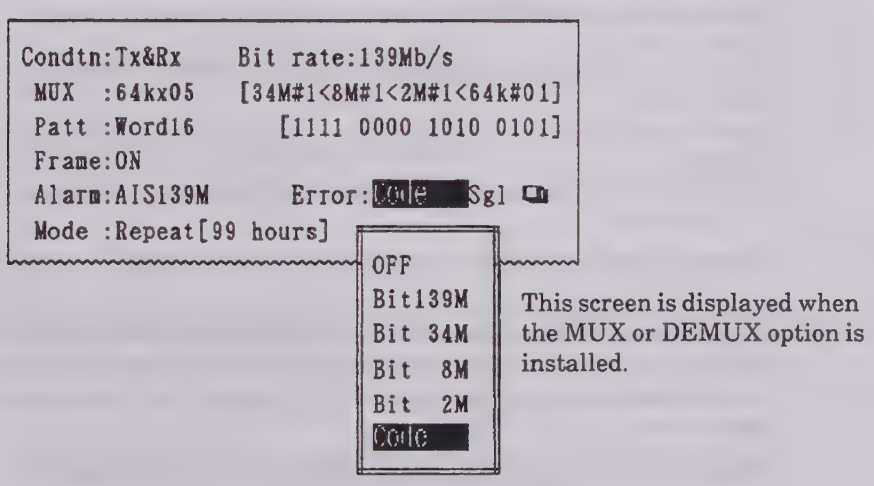


Fig. 5-12 Setting an Error Addition Type

Notes: • *The error addition types listed in the table below can be set.*

If the MUX or DEMUX option is not installed, the settings in the MUX OFF columns are adopted.

Transmit section bit rate	139 M/b					34 Mb/s			
MUX final tributary	MUX OFF	34 M	8 M	2 M	64 k	MUX OFF	8 M	2 M	64 k
Bit 139 M	○	○	○	○	○				
Bit 34 M		○	○	○	○	○	○	○	○
Bit 8 M			○	○	○		○	○	○
Bit 2 M				○	○			○	○
Code	○	○	○	○	○	○	○	○	○

Transmit section bit rate	8 Mb/s			2 Mb/s	
MUX final tributary	MUX OFF	2 M	64 k	MUX OFF	64 k
Bit 139 M					
Bit 34 M					
Bit 8 M	○	○	○		
Bit 2 M		○	○	○	○
Code	○	○	○	○	○

○: Can be set

- *Because bit errors are added to all signals, a frame or CRC-4 error occurs.*
- *If MUX is set to ON, the bit rate is set to 34 Mb/s or less, final tributary is set to 64 k, and an error is Code, an added error value may be different from a displayed value. This is because all 1s are set in the remaining 29 channels of the time slot, and so the number of groups of four or more sequential zeros becomes small. A group of four or more sequential zeros causes HDB3 conversion.*
- *This item can be set when Condtn:Tx&Rx or Condtn: Tx is selected.*

(2) Error addition rate:

Sets the rate at which the error is to be added to the transmitter section.

Setting ranges are as follows:

[Setting ranges]
1E-3: Adds the error at a rate of 1E-3.
1E-4: Adds the error at a rate of 1E-4.
1E-5: Adds the error at a rate of 1E-5.
1E-6: Adds the error at a rate of 1E-6.
1E-7: Adds the error at a rate of 1E-7.
Sgl: Adds the error manually

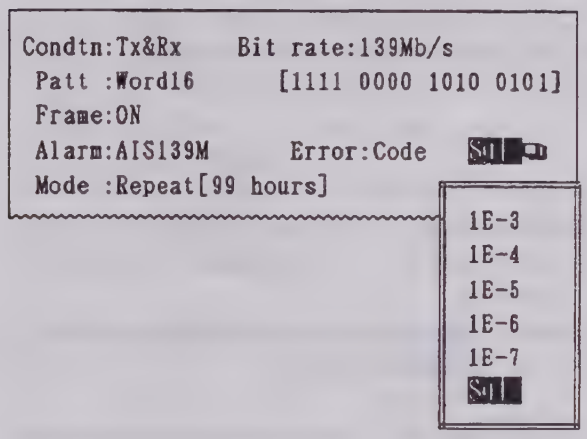


Fig. 5-13 Setting the Error Addition Rate

Notes: • *If the error addition type is set to OFF, this item cannot be set.*
• *This item can be set when Condtn:Tx&Rx or Condtn:Tx is selected.*

(3) Adding a single error:

Manually adds a single error to the transmitter section. One single error is added each time the Set key is pressed while the inverted cursor is positioned on the button icon.

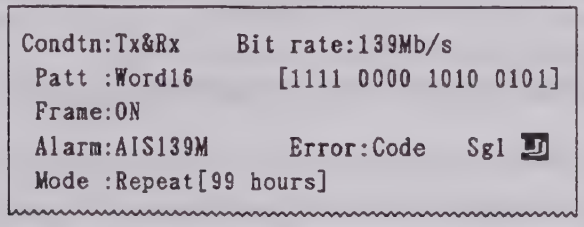


Fig. 5-14 Setting Single Error Addition

Notes: • *This item can be set when the error addition rate is set to Single.*
• *This item can be set when Condtn:Tx&Rx or Condtn:Tx is selected.*

5.2.9 Measurement mode

This sets the measurement cycle of the receiver section.

[Settable items] The following items can be set:

- Measurement mode
- Measurement time

(1) Measurement mode:

Sets the measurement mode for the receiver section.

Setting ranges are as follows:

[Setting ranges]
Single: Performs a measurement once.
Repeat: Performs a measurement repeatedly.
Manual: Performs a measurement manually.

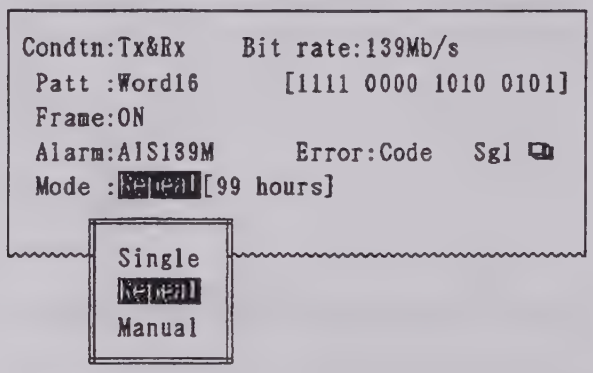


Fig. 5-15 Setting the Measurement Mode

Notes:
- *If a measurement mode is changed during a measurement, the measurement is restarted.*
- *All measurements are started when the START key is pressed.*
- *If Manual is set, a measurement ends when the STOP key is pressed.*
  If Single or Repeat is set, a measurement ends when the measurement time expires, or the STOP key is pressed. If Repeat is set, the next measurement is performed immediately after the measurement time expires and the previous measurement ends.
- *This item can be set when Condtn:Tx&Rx or Condtn:Rx is selected.*

(2) Measurement time:

Sets the measurement time for the receiver section.

Setting ranges are as follows:

[Setting ranges] 1 to 99 secs (in 1 sec steps)
1 to 99 mins (in 1 min steps)
1 to 99 hours (in 1 hour steps)
1 to 99 days (in 1 day steps)

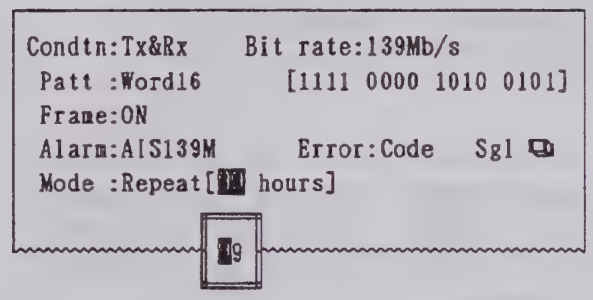


Fig. 5-16 Setting the Measurement Time (1)

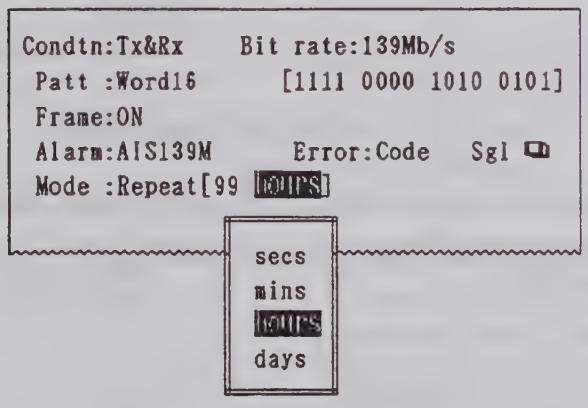


Fig. 5-17 Setting the Measurement Time (2)

Notes:
- *If a measurement time is changed during a measurement, the measurement is restarted.*
- *This item can be set when the measurement mode is set to Repeat or Single.*
- *This item can be set when Condtn:Tx&Rx or Condtn:Rx is selected.*

5.2.10 Jitter mode

Sets the jitter generation condition.

[Settable items] The following items can be set:

- With/without jitter generation

(1) With/without jitter generation:

Sets with/without jitter generation.

Setting ranges are as follows:

[Setting ranges] OFF: Jitter is not generated.
ON: Jitter is generated.

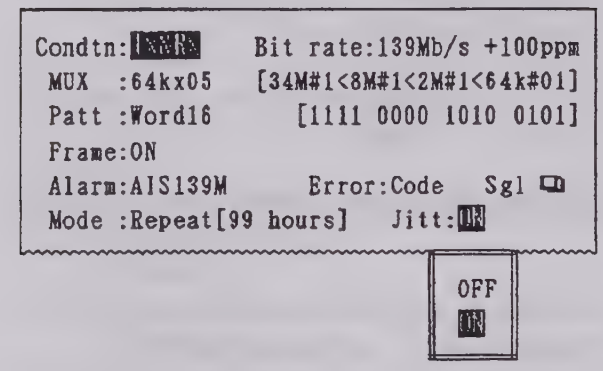


Fig. 5-120 Setting the Jitter Mode

Notes:

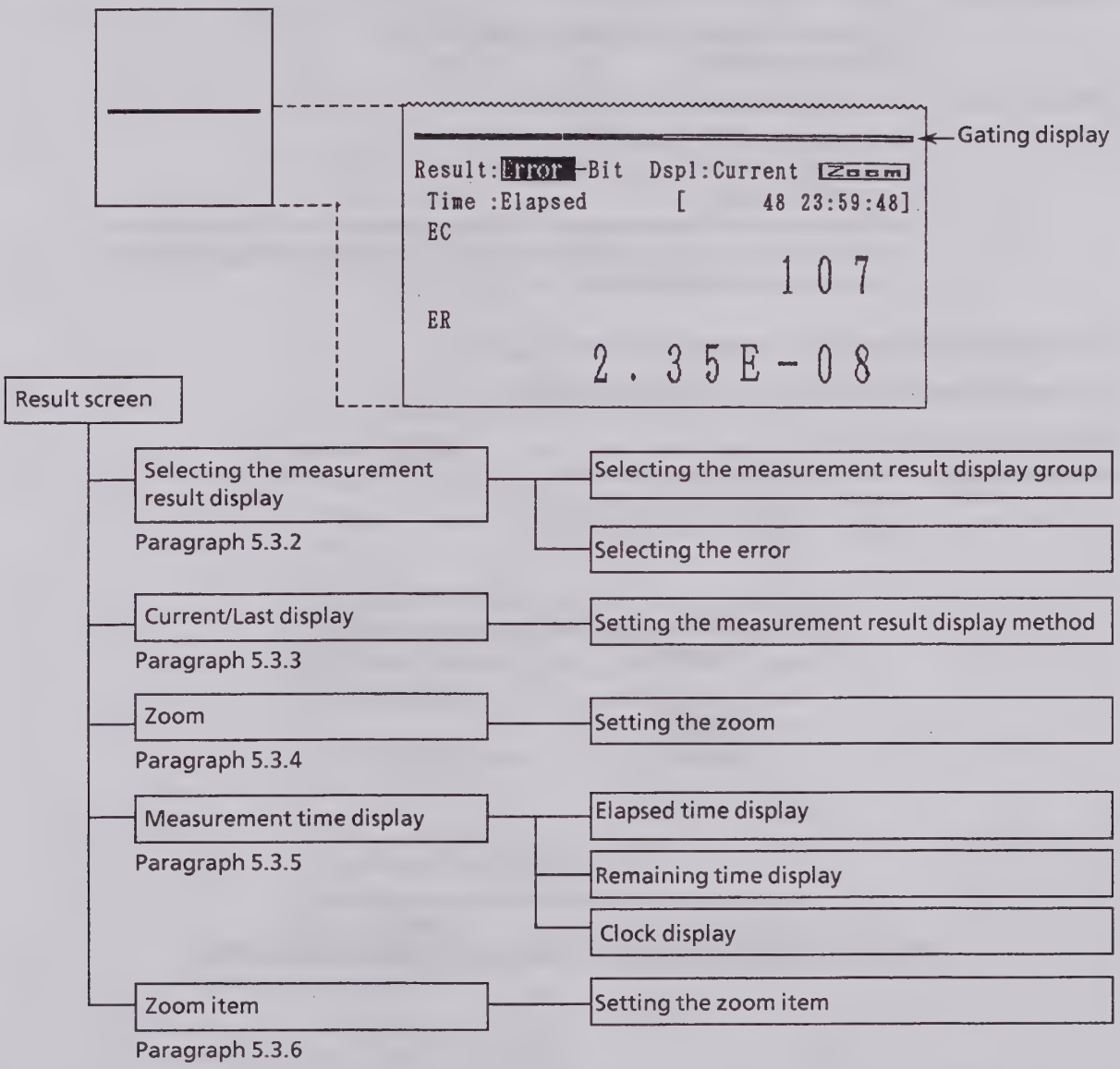
- *The "Jitt:ON" is displayed only when the jitter generation/measurement option is installed.*
- *When the jitter generation/measurement option is installed, jitter measurement is carried out regardless of this setting.*

5.3 Settings on the Result Screen

5.3.1 Functions

These set the display of a measured error alarm.

The Result screen and settings are as follows:



Notes: • *In the gating display at the top of the Result screen, the solid line section represents the elapsed measurement time and the twin lines section (=) represents the remaining time.*

• *When Manual is set, the measurement gating display is rewritten each 200 ms. The gating display becomes full in a cycle of eight seconds.*

• *The measurement gating display is cleared at a measurement start, and lights according to the rate of the elapsed measurement time. When the measurement ends, the entire gating display becomes a solid line.*

5.3.2 Selecting the measurement result display

This sets the measurement result to be displayed. Because all measured results cannot be displayed on the Result screen, measured results are classified into error and alarm groups.

[Settable items] The following items can be set:

- The measurement result display group selection
- The error selection

[Related items] The following items affect this setting:

- Bit rate of receiver section
- The receiver section frame
- DEMUX (option)
- CRC-4 ON/OFF (See paragraph 5.7 "Settings on the Setup:Measure Screen".)
- Service state (In-service or Out-of-service set on the Setup:Measure screen explained in paragraph 5.7)

(1) Selecting the measurement result display group

Switches between the error and alarm displays alternately.

Setting ranges are as follows:

[Setting ranges] Error : Displays an error group.
Alarm1 : Displays alarm group (1).
Alarm2 : Displays alarm group (2).

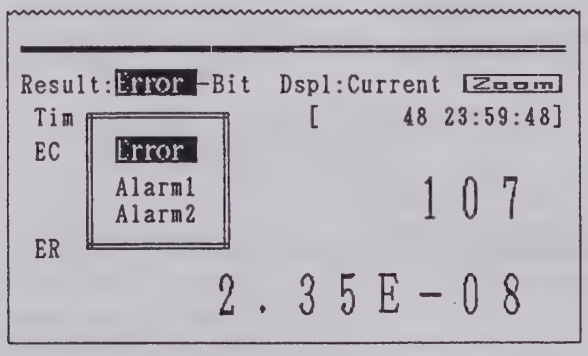


Fig. 5-18 Selecting the Measurement Result Display Group

Examples of group display screens without zoom display specified are shown below:

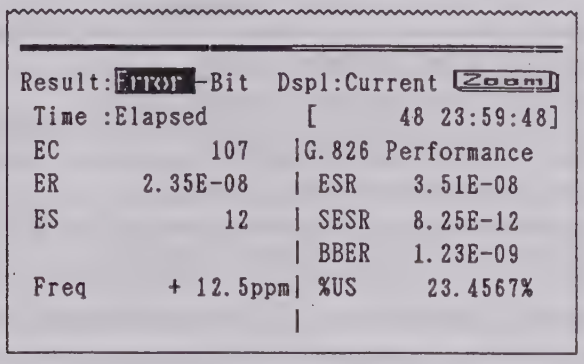

Result:Error -Bit Dspl:Current Zoom
Time :Elapsed [48 23:59:48]
EC 107 |G.826 Performance
ER 2.35E-08 | ESR 3.51E-08
ES 12 | SESR 8.25E-12
| BBER 1.23E-09
Freq + 12.5ppm| %US 23.4567%
|

Fig. 5-19 Error Group Display

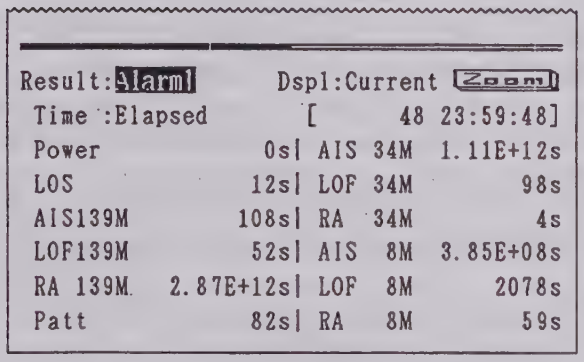

Result:Alarm1 Dspl:Current Zoom
Time :Elapsed [48 23:59:48]
Power 0s| AIS 34M 1.11E+12s
LOS 12s| LOF 34M 98s
AIS139M 108s| RA 34M 4s
LOF139M 52s| AIS 8M 3.85E+08s
RA 139M 2.87E+12s| LOF 8M 2078s
Patt 82s| RA 8M 59s

Fig. 5-20 Alarm Group (1) Display

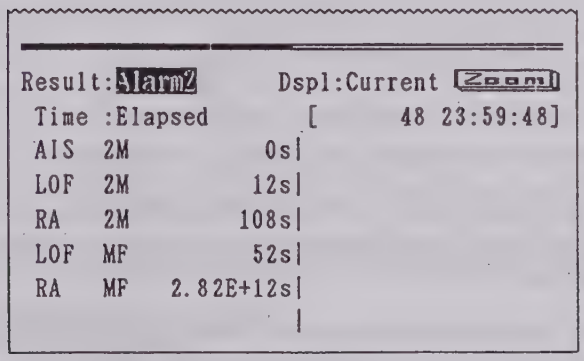


Fig. 5-21 Alarm Group (2) Display

Meanings of displayed items are as follows:

Displayed item			Description
Error Group	EC		Displays the number of detected errors.
	ER		Displays the rate of the detected error.
	ES		Displays the total error time, in seconds.
	Freq		Displays the frequency deviation, in ppm.
	G.821	%ES	Displays %ES conforming to ITU-T recommendation G.821.
		%SES	Displays &SES conforming to ITU-T recommendation G.821.
		%DM	Displays %DM conforming to ITU-T recommendation G.821.
		%US	Displays %US conforming to ITU-T recommendation G.821.
		Test	Evaluates the measurement results of the above errors in accordance with ITU-T recommendation G.821, and displays the result. The evaluation uses the threshold value set on the Setup:Performance screen explained in paragraph 5.8.
	G.826	ESR	Displays ESR conforming to ITU-T recommendation G.826.
		SESR	Displays SESR conforming to ITU-T recommendation G.826.
		BBER	Displays BBER conforming to ITU-T recommendation G.826.
		%US	Displays %US conforming to ITU-T recommendation G.826.
		Test	Evaluates the measurement results of the above errors in accordance with ITU-T recommendation G.821, and displays the result. The evaluation uses the threshold value set on the Setup:Performance screen explained in paragraph 5.8.
	M.2100	ES	Displays ES conforming to ITU-T recommendation M.2100.
		SES	Displays SES conforming to ITU-T recommendation M.2100.
		Test	Displays whether measured results of the above errors are correct according to results of judgment conforming to ITU-T recommendation M.2100. The threshold value set on the Setup:Performance screen explained in paragraph 5.8 is used for judgment.
Alarm Group	Power		Displays the total power-off time, in seconds.
	LOS		Displays the total signal-off time, in seconds.
	AIS (*1)		Displays the total AIS time, in seconds.
	LOF (*1)		Displays the total frame loss time, in seconds.
	RA (*1)		Displays the total remote alarm time, in seconds.
	Patt		Displays the total pattern sync loss time, in seconds.
	LOF MF		Displays the total multiframe loss time, in seconds.
	RA MF		Displays the total multiframe remote alarm time, in seconds.

*1 The value is displayed for each bit rate.

Notes: • *Alarm group (2) can be specified when an alarm cannot be displayed in alarm group (1).*

• *The alarm group display differs depending on the set conditions.*

• *If a measurement limit value is exceeded (overflow or under flow), an inequality sign is added to the displayed measurement limit value.*
Examples: >9.99E + 15, <1.00E −15, >+100.0 ppm, <−100.0 ppm, etc.

(2) Selecting the error:

Set the error type for error group display.

Setting ranges are as follows:

[Setting ranges]

Bit	:	Displays the result of a bit error measurement.
Code	:	Displays the result of a code error measurement.
FRM139M	:	Displays the result of a 139M frame error measurement.
FRM 34M	:	Displays the result of a 34M frame error measurement.
FRM 8M	:	Displays the result of an 8M frame error measurement.
FRM 2M	:	Displays the result of a 2M frame error measurement.
CRC-4	:	Displays the result of a CRC-4 error measurement.

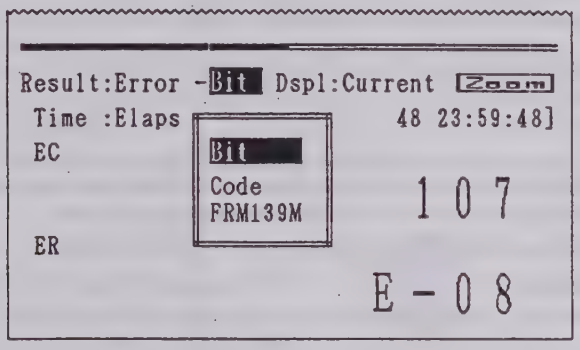


Fig. 5-22 Selecting the Measurement Result Display

Notes: • *The performance measurement result is displayed for each condition when the item indicated with a circle is selected.*

Service condition	In-service					Out-of-service
Object frame*1	139M	34M	8M	2M		
				CRC OFF	CRC ON	
Bit						○*4
FRM 139M	○					
FRM 34 M		○				
FRM 8M			○			
FRM 2M				○	○*2	
CRC-4					○*3	

**1 The object frame is set on the 5.8 Setup:Performance screen when DEMUX is ON. The frame of bit rate is used when DEMAX is OFF.*

**2 The result is not displayed for G.826 or M.2100.*

**3 The result is not displayed for G.821.*

Select the performance on the 5.8 Setup:Performance screen.

Note: ● *The errors listed in the table below can be set.*
If neither the MUX nor DEMUX option is installed, the settings in the DEMUX OFF columns are adopted.

Receive section bit rate	139 Mb/s				
DEMUX final tributary	DEMUX OFF	34 M	8 M	2 M	64 k
Bit	◎	◎	◎	◎	◎
Code	○	○	○	○	○
FRM 139 M	△	○	○	○	○
FRM 34 M		△	○	○	○
FRM 8 M			△	○	○
FRM 2 M				△	○
CRC-4				▲	●

Receive section bit rate	34 Mb/s			
DEMUX final tributary	DEMUX OFF	8 M	2 M	64 k
Bit	◎	◎	◎	◎
Code	○	○	○	○
FRM 139 M				
FRM 34 M	△	○	○	○
FRM 8 M		△	○	○
FRM 2 M			△	○
CRC-4			▲	●

Receive section bit rate	8 Mb/s			2 Mb/s	
DEMUX final tributary	DEMUX OFF	2 M	64 k	DEMUX OFF	64 k
Bit	◎	◎	◎	◎	◎
Code	○	○	○	○	○
FRM 139 M					
FRM 34 M					
FRM 8 M	△	○	○		
FRM 2 M		△	○	△	○
CRC-4		▲	●	▲	●

Notes: ○: *Can be set*
◎ : *Can be set when out-of-service is selected.*
△ : *Can be set when frame is on.*
● : *Can be set when CRC-4 is on.*
▲ : *Can be set when frame and CRC-4 are both on.*

5.3.3 Current/Last display

This specifies the measurement result display method.

[Settable items] The following item can be set:

- The measurement result display method

(1) Setting the measurement result display method:

Set the measurement result display method.

Setting ranges are as follows:

[Setting ranges]

Current: Displays measured values from a measurement start to the current time. The Error Count (EC) and Error Rate (ER) are updated every 200 ms. Other measured results are updated every second.

Last: The display changes each time a measurement ends. The immediately-previous measurement result is held during the next measurement.

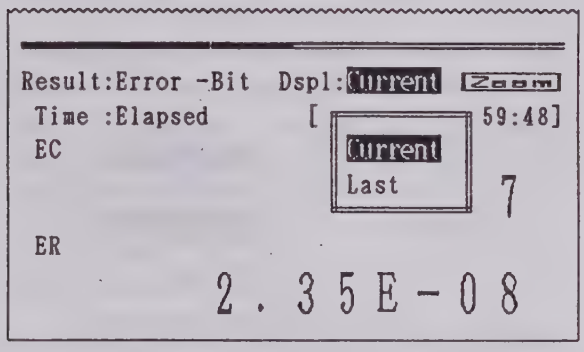


Fig. 5-23 Measurement Result Display Method

Note: *This specification affects the alarm and error LEDs at the bottom of the display. When Current is selected, a history runs from alarm or error occurrence to next measurement start. When Last is selected, a history runs from next measurement start to end.*

5.3.4 Zoom

This sets whether to enlarge a measurement result. When the zoom display is specified, two arbitrary items selected from each group can be enlarged on the screen.

[Settable items] The following item can be set:

- The zoom

(1) Setting the zoom:

Specifies or cancels the zoom display.

When the SET key is pressed while the inverted cursor is positioned on the zoom button icon, zoom is specified or canceled.

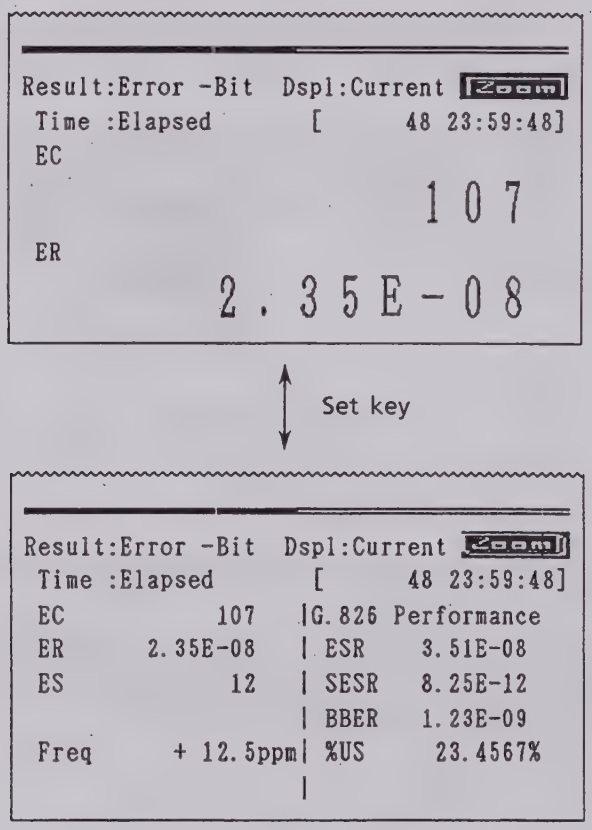


Fig. 5-24 Setting the zoom

5.3.5 Measurement time display

This sets the type of measurement time display.

[Settable items] The following item can be set:

- The measurement time display

[Related items] The following item affects this setting:

- Measurement mode

(1) Setting the measurement time display

Sets the time displayed during a measurement.

Setting ranges are as follows:

[Setting ranges]

Elapsed:	Displays the time elapsed since a measurement started.
Timed:	Displays the time remaining until a measurement ends.
Date & Time:	Displays the current time.

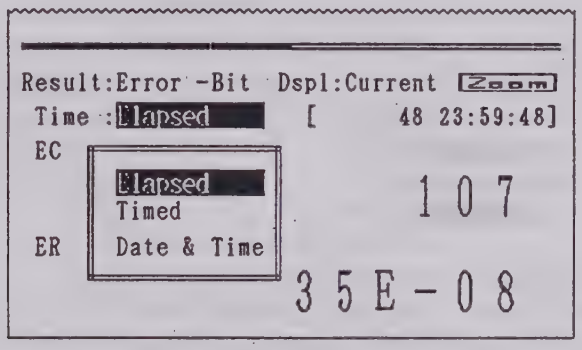


Fig. 5-25 Setting the measurement time display

Notes: • *If the measurement mode is set to Manual, Timed cannot be selected.*

• *If Date & Time is set, the time is displayed in the following format:*
[Year-Month-Day hour:min:sec]

If Elapsed or Timed is set, a remaining time or elapsed time is displayed in the following format:
[Day hour:min:sec]

5.3.6 Zoom item

This sets the zoom item.

[Settable items] The following item can be set:

- The zoom item

[Related items] The following items affect this setting:

- Zoom
- Measurement result display selection
- Bit rate
- Frame
- DEMUX (option)

(1) Setting the zoom item:

Sets the item to be zoomed when the zoom display is specified. For the setting range, two arbitrary items can be selected from items displayed on the screen without the zoom display specified.

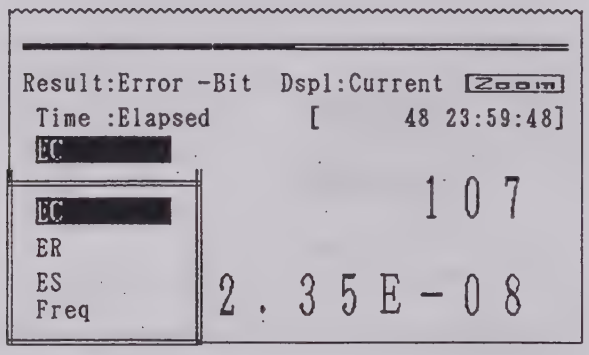


Fig. 5-26 Setting the Zoom Item

Note: *This item can be set when the zoom display is specified.*

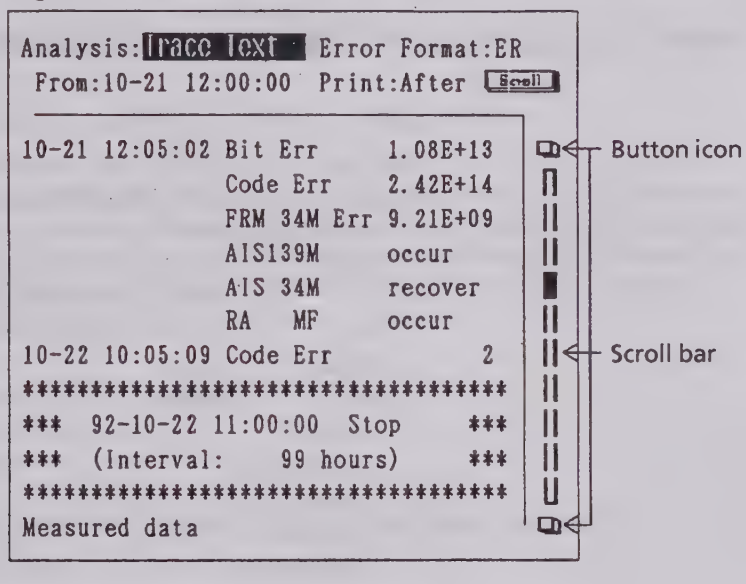
5.4 Settings on the Analysis:Trace Text Screen

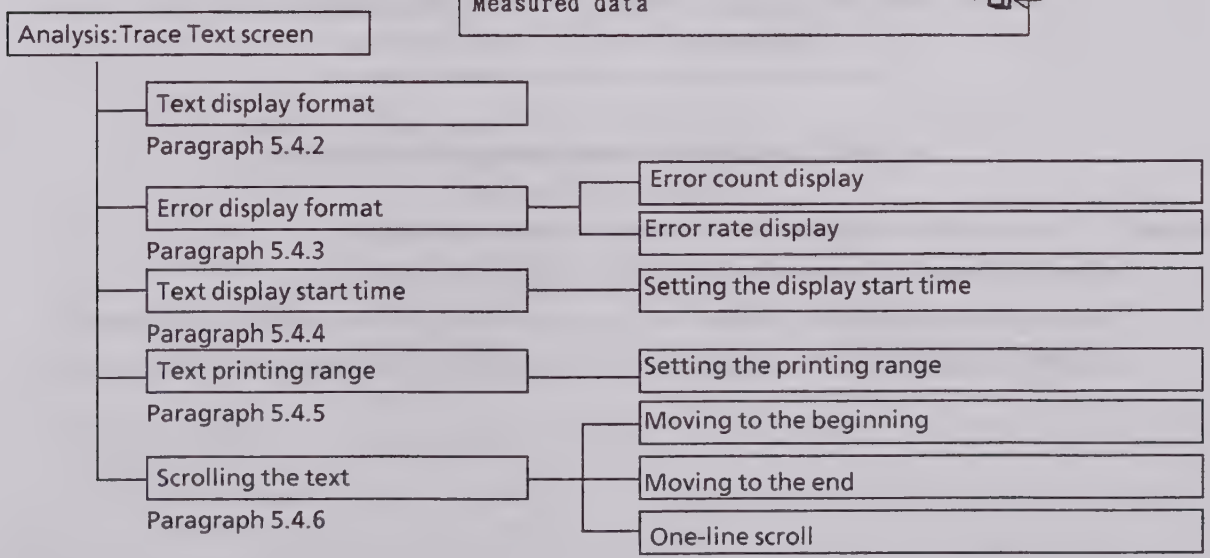
5.4.1 Functions

When the MP1520B starts a measurement, it automatically stores the measuring condition, the measured result, and any errors and alarms which occur during the measurement. The Analysis:Trace Text screen displays the stored data in text format.

The progress from when a measurement starts to the current time is stored during a measurement. The progress of a previous measurement is stored when the measurement ends. Because the memory capacity is limited, if the memory becomes full, subsequent data is discarded (see the note). When a new measurement starts (including when a measurement is started by pressing the Start key or by executing the GPIB/RS-232C start command, or when a measurement is restarted by changing set conditions), the measurement progress data collected during the previous measurement is cleared. If a repeat measurement is specified, the previous measurement data is not cleared but is stored sequentially even if the next measurement starts.

The Analysis:Trace Text screen and settings are as follows:





Note: *The number of lines stored depends on the measurement mode, error type, or alarm type, but at least 10,000 lines can be stored.*

5.4.2 Text display format

The following texts can be displayed:

- Measurement condition data display: Displays the measurement condition of the receiver section.
- Measurement start time display: Displays the measurement start time.
- Error or alarm display: If an error or an alarm occurs, this text displays the error or alarm occurrence time and contents. If an alarm occurs, this text also displays alarm recovery.
- Display of measurement end discrimination data: Displays both the measurement end time and how long the measurement took.
- Measurement result data display: Displays the measurement result.
- Storage limit display: Displays the fact that the internal memory is full.

(1) Measurement condition data display:

Measurement condition data is displayed first when a measurement starts.

```
 1         10        20        30       38
+---------+---------+---------+--------+
|***  Anritsu MP1520B PDH Analyzer  ***|
|Measuring condition (Out-of-service)  |
|  Bit rate: 139Mb/s                   |
|  DEMUX                        64k*05|
|               [34M#1>8M#2>2M#1>64k#12]|
|  Patt    :  Word16 [0101110000111010]|
|  Frame   :      ON                   |
|  Mode    :  Repeat          [99 hours]|
|  Jitter                              |
|    Meas mode:                Intv10.2s|
|    Range    :                    20UI|
|    Filter   :                  HP1+LP|
|    Threshold:                10.0UIo-p|
+---------+---------+---------+--------+
```

Fig. 5-27 Setting the measurement time display

Notes:
- *The measurement condition set in the receiver section is displayed.*
- *Displayed data differs depending on whether an option is installed.*
- *If a repeat measurement is specified, this item is not displayed when a second or subsequent measurement starts.*

(2) Measurement start time display:

The start time is displayed when a measurement starts. When a measurement condition is displayed, the measurement start time is displayed after the measurement condition.

The figure below is a display example.

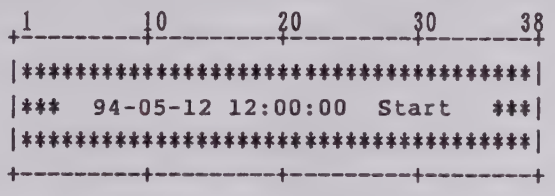


Fig. 5-28 Measurement Start Data Display

Note: *When a repeat measurement is specified, the measurement start time is displayed each time a measurement starts.*

(3) Error or alarm display:

The measurement cycle is divided into one second cycles. If an error occurs in each cycle, the occurrence time, error type, and error value in one second are displayed. An error value is displayed by an error count or an error ratio (see paragraph 5.4.3 for the setting). If an alarm occurs or is recovered, the occurrence or recovery time and the alarm type are displayed. The figures below are display examples.

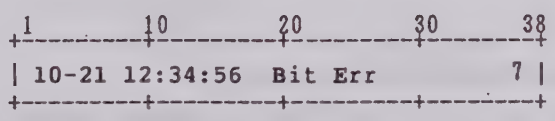


Fig. 5-29 Error Display (for One Type of Error in the Same Second)

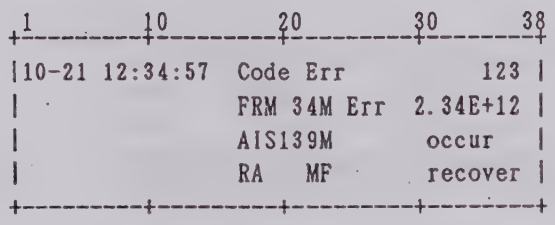


Fig. 5-30 Error and Alarm Displays (for Error and Alarm in the Same Second)

Notes: • *If an alarm occurs, "occur" is displayed. If an alarm is recovered, "recover" is displayed.*

• *Displayed error and alarm types are as follows:*

Display format	Description
Bit Err	Bit error
Code Err	Code error
FRM Err (*1)	Frame error
CRC-4 Err	CRC error
Power Fail	Power-off alarm
LOS	Signal-off alarm
Patt sync	Pattern synchronization out
AIS (*1)	AIS alarm
LOF (*1)	Frame loss
LOF MF	Multiframe loss
RA (*1)	Remote alarm
RA MF	Multiframe remote alarm

The above errors are listed in display sequence.
*1 Bit rate display sequence: 139M → 34M → 8M → 2M

• *If an alarm occurs and is recovered in the same second, the events are displayed in order of occurrence.*

(4) Display of measurement end discrimination data:

When a measurement ends, both the measurement end time and the time between the measurement start time and the measurement end time are displayed.

The figure below is a display example.

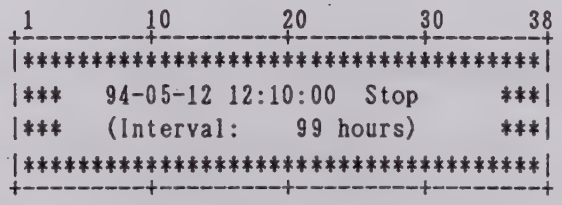


Fig. 5-31 Measurement End Data Display

Note: *When a repeat measurement is specified, the measurement end time is displayed each time a measurement ends.*

(5) Measurement result data display:

When a measurement ends, measured results through a measurement cycle are displayed.

The figure below is a display example.

```
1         10        20        30      38
+---------+---------+---------+-------+
|Measured data
|  Freq                        +100.0ppm
|
|  Errors
|    Bit      EC              1.00E+08
|             ER              1.00E-09
|             ES              1.89E+08
|    Code     EC              1.22E+07
|             ER              2.64E-05
|             ES                   234
|    FRM139M  EC                   233
|             ER              8.12E-04
|             ES                    92
|
|  G.821 Performance
|             %ES               0.0000%
|             %SES             99.9999%
|             %DM             100.0000%
|             %US               1.1111%
|             Test           Unacceptable
|
|  G.826 Performance
|             ESR              3.52E-08
|             SESR             8.21E-12
|             BBER             1.23E-09
|             %US               23.4567%
|             Test           Unacceptable
|
|  M.2100 Performance
|             ES               1.08E+12
|             SES              2.34E+08
|             Test           Unacceptable
|
|  Alarm Seconds
|             Power            1.11E+09s
|             LOS                     5s
|             AIS139M          2.34E+08s
|             LOF139M          4.56E+07s
|             RA 139M               123s
|             Patt                   12s
|
|  Jitter
|             Rx amptd        10.12UIp-p
|                +Peak         5.05UI+p
|                -Peak         5.07UI-p
|             Hit count     5.67E+08
|             Hit seconds      12345
|             %Hit FS        12.3456%
+---------+---------+---------+-------+
```

One of these items is displayed (not displayed when a measurement is not performed).

Fig. 5-32 Measurement Result Data Display

Notes: • *For frequency deviation, the value measured last is displayed.*

• *Only the measured results of the error, performance, or alarm being measured are displayed.*

• *If a repeat measurement is specified, the measurement result is displayed each time a measurement ends.*

(6) Storage limit display:

This item is displayed when the memory becomes full during a measurement. It is always displayed last. The figure below is a display example.

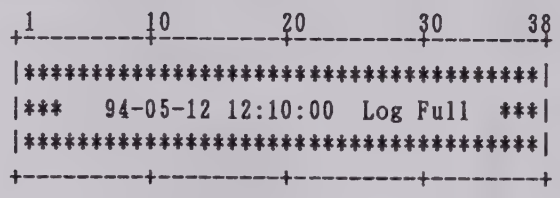


Fig. 5-33 Storage Limit Display

5.4.3 Error display format

This sets the error display format.

[Settable items] The following item can be set:

- The error display format

(1) Setting the error display format:

Sets the display format of the measured error value per second.

Setting ranges are as follows:

[Setting ranges] EC: Displays an error in error count format.

ER: Displays an error in error rate format.

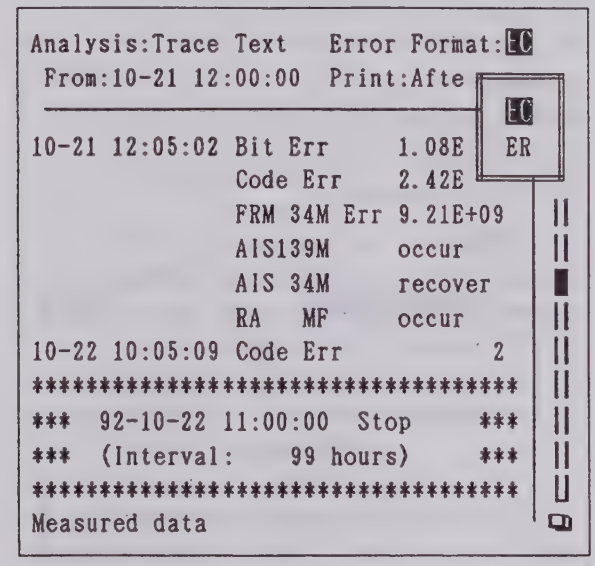


Fig. 5-34 Setting the Error Display Format

5.4.4 Text display start time

This sets the text display start time.

[Settable items] The following item can be set:

- The text display start time

(1) Setting the text display start time:

Specifies the time displayed at the beginning of the text. This item is usually displayed in the format of month, day, hour, minute, and second on the screen. However, when setting this item, a year can also be specified.

Setting ranges are as follows:

[Setting ranges] Year-Month-Day hour:min:sec

Year:	An integer from 00 to 99
Month:	An integer from 01 to 12
Day:	An integer from 01 to 31
hour:	An integer from 00 to 23
min:	An integer from 00 to 59
sec:	An integer from 00 to 59

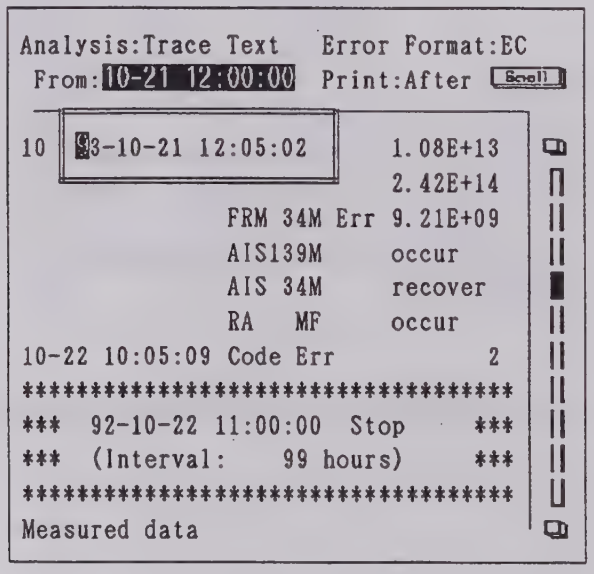


Fig. 5-35 Setting the Text Display Start Time

Notes:

- *If a time text is not set, the texts after the set time are displayed.*
- *A nonexistent date cannot be set.*
- *Specify the lower two digits of a year. A specification of 00 means the year 2000.*

5.4.5 Text printing range

This sets the range of text printing to a printer.

[Settable items] The following item can be set:

- The text printing range

(1) Setting the text printing range:

Sets the range of text printing to a printer. Use the Copy key for printing.

[Setting ranges]
- Dspl: Prints the range displayed on the screen.
- All: Prints the entire range.
- After: Prints the range displayed on the screen and what follows.
- Before: Prints the range displayed on the screen and what is before it.

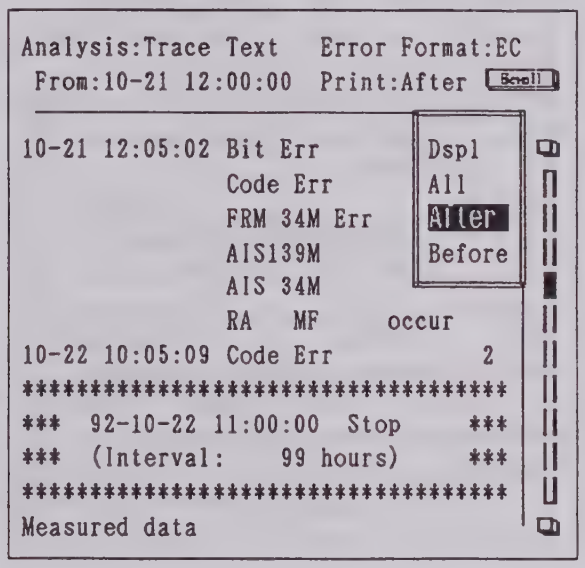


Fig. 5-36 Setting the Text Printing Range

Notes:
- *If After or Before is specified, the range displayed on the screen is also printed.*
- *See paragraph 5.14.1 for printing examples.*

5.4.6 Scrolling the text

Scrolls the displayed text.

[Settable items] The following item can be set:

- Moving to the beginning of the text
- Moving to the end of the text
- Scroll line-by-line

(1) Moving to the beginning of the text:

Displays the text so that the beginning of the text lies on the first line of the screen.

Press the Set key while the inverted cursor is positioned at the top of the scroll bar.

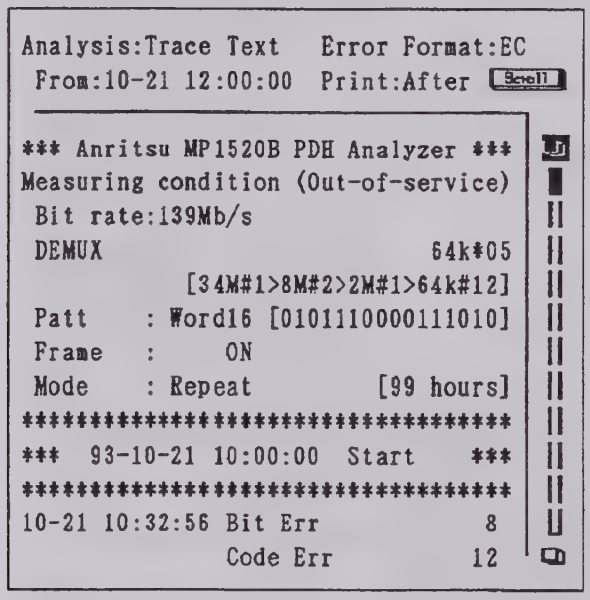


Fig. 5-37 Moving to the Beginning of the Text

Notes:
- *The scroll bar displayed to the right of the screen indicates a collected measurement progress. The solid scroll bar indicates the currently displayed part.*
- *The measurement condition is displayed at the beginning of the text.*

(2) Moving to the end of the text:

Displays the text so that the end of the text lies on the last line of the screen.

Press the Set key while the inverted cursor is positioned over the button icon at the bottom of the scroll bar.

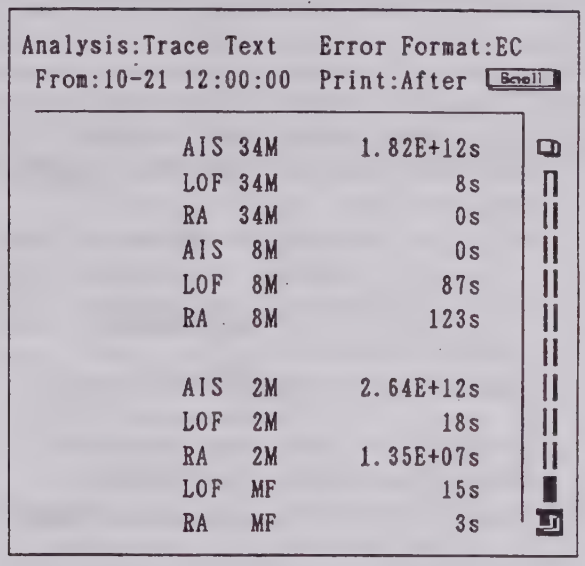


Fig. 5-38 Moving to the End of the Text

Notes: *The following data is displayed at the end of the text:*

- *If the memory becomes full, the time that the memory become full is displayed.*
- *The progress to the current time is displayed during a measurement.*
- *If a measurement is stopped, the measured result is displayed.*

(3) Scroll line-by-line:

Scrolls up or down a text one line at a time.

Scrolls the text up or down one line at a time. Move the inverted cursor to the scroll button icon and press the Set key. Then the device enters the scroll state. In this state press the ↑ or ↓ key to scroll the text for one line. Press the Set key again to release the device from the scroll state. The ↑ and ↓ keys can be used to move the cursor.

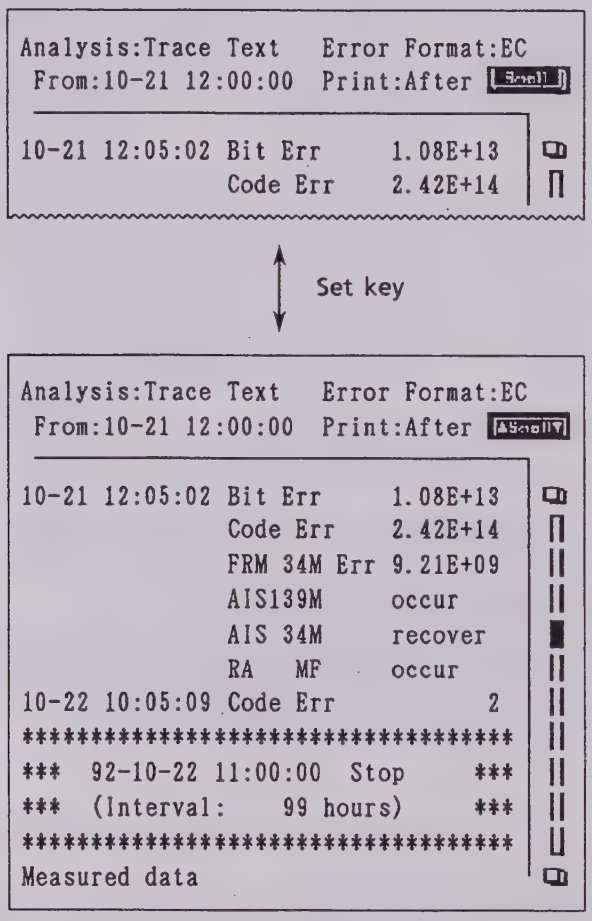


Fig. 5-39 Scroll Line-by-Line

Notes: • *The ↑ or ↓ key scrolls the text in the same direction that the scroll bar display area moves. Therefore, the ↑ key moves the text down.*

• *The text cannot be scrolled up above the beginning.*

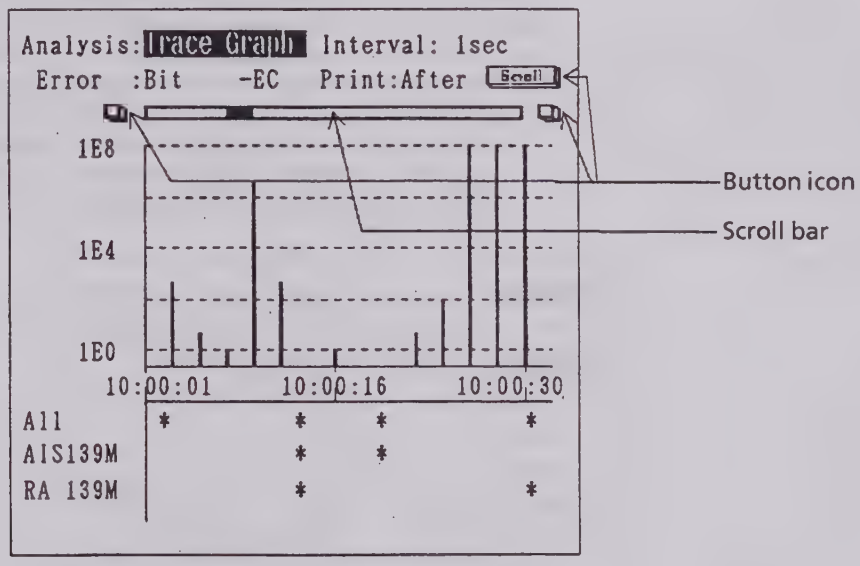
5.5 Settings on the Analysis:Trace Graph Screen

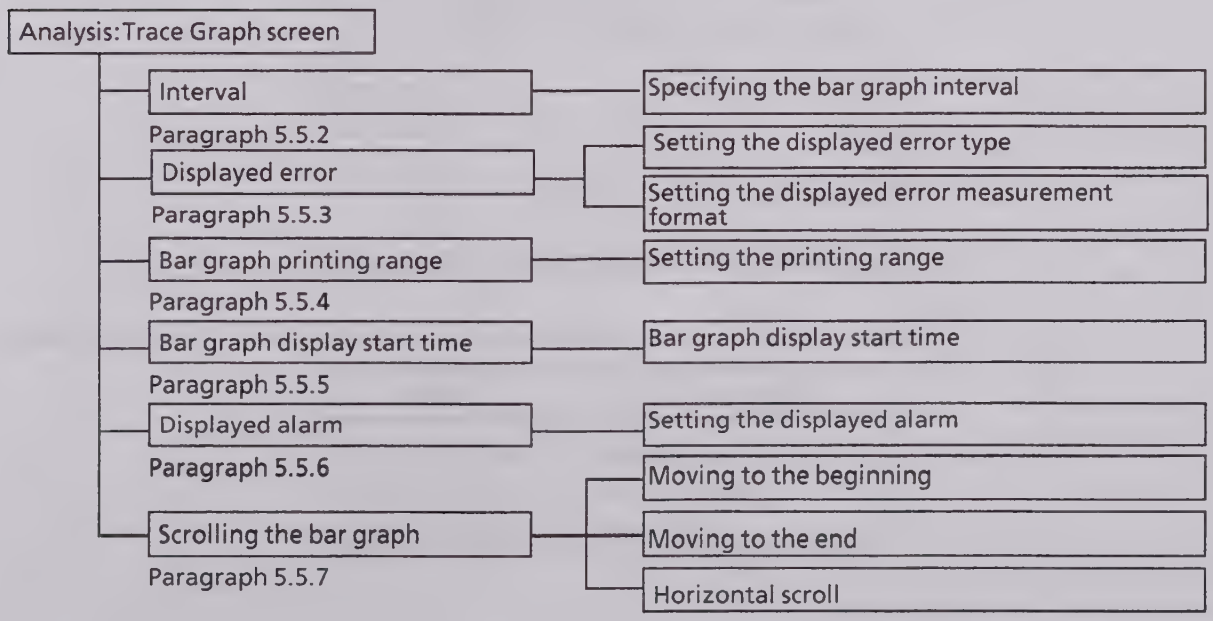
5.5.1 Functions

The progress of an error during a measurement is displayed in bar graph format.

The progress from when a measurement starts to the current time is stored during a measurement. The progress of a previous measurement is displayed when the measurement ends. Because the memory capacity is limited, if the memory becomes full, subsequent data is discarded. When a new measurement starts (including when a measurement is started by pressing the Start key or by executing the GPIB/RS-232C start command, or when a measurement is restarted by changing set conditions), the measurement progress data collected during the previous measurement is cleared. If a repeat measurement is specified, the previous measurement data is not cleared but is stored sequentially even if the next measurement starts.

The Analysis:Trace Graph screen and settings are as follows:





Notes:
- *The scroll bar displayed on the screen indicates the time between the measurement-starting time and the last collection (the current time during a measurement, the time when a measurement ended, or if the memory capacity is exceeded, the time when the memory become full). The solid scroll bar indicates the currently displayed range.*
- *The memory capacity is the same as that of Analysis:Trace Text. It depends on the measurement mode, error type, or alarm type.*
- *The vertical axis of the bar graph has a logarithmic scale.*
- *For a part where the bar graph indicates that a measurement is not performed, NO DATA is displayed.The number of lines stored depends on the measurement mode, error type, or alarm type, but at least 10,000 lines can be stored.*

5.5.2 Interval

This sets the interval time of the bar graph.

[Settable item] The following item can be set:

- The bar graph interval

(1) Setting the bar graph interval:

Sets the bar graph interval. Thirty bars are displayed on the screen. If the bar graph interval is set to one second, the errors in 30 seconds can be checked.
Setting ranges are as follows:

[Setting ranges]

1sec:	Sets the bar graph interval to one second.
10secs:	Sets the bar graph interval to ten seconds.
1min:	Sets the bar graph interval to one minute.
10mins:	Sets the bar graph interval to ten minutes.
1hour:	Sets the bar graph interval to one hour.
6hours:	Sets the bar graph interval to six hours.
1day:	Sets the bar graph interval to one day.
4days:	Sets the bar graph interval to four days.

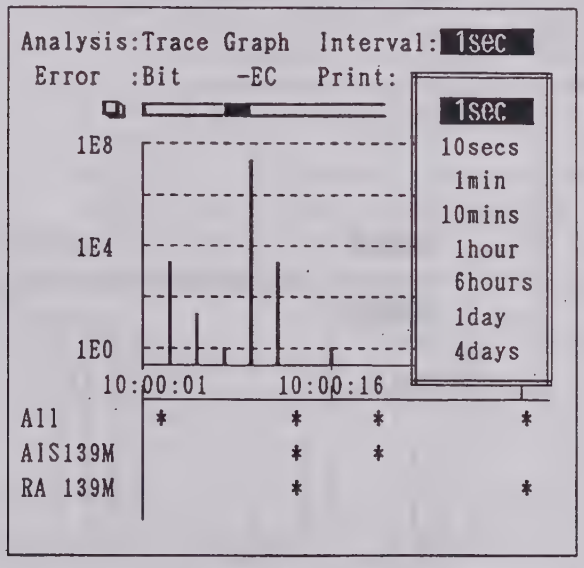


Fig. 5-40 Setting the Bar Graph Width

Notes: *When this item is set, the bar graph display start time is changed as follows:*

Setting	Start time display
10 mins or less	hour:min:sec
1hours, 6hours	Day hour:min
1 day or more	Month-Day

5.5.3 Displayed error

This sets the error type and measurement format displayed in bar graph format.

[Settable items] The following items can be set:
- The displayed error type
- The displayed error measurement format

[Related items] The following items affect this setting:
- Bit rate
- Frame
- DEMUX (option)
- CRC-4 ON/OFF (set on the Setup:Measure screen explained in paragraph 5.7)
- Service state (In-service/Out-of-service, set on the Setup:Measure screen explained in paragraph 5.7)

(1) Setting the displayed error type:

Sets the type of error displayed in bar graph format.

Setting ranges are as follows:

[Setting ranges]

Bit:	Displays a bit error.
Code:	Displays a code error.
FRM 139M:	Displays a 139M frame error.
FRM 34M:	Displays a 34M frame error.
FRM 8M:	Displays an 8M frame error.
FRM 2M:	Displays a 2M frame error.
CRC-4:	Displays a CRC-4 error.

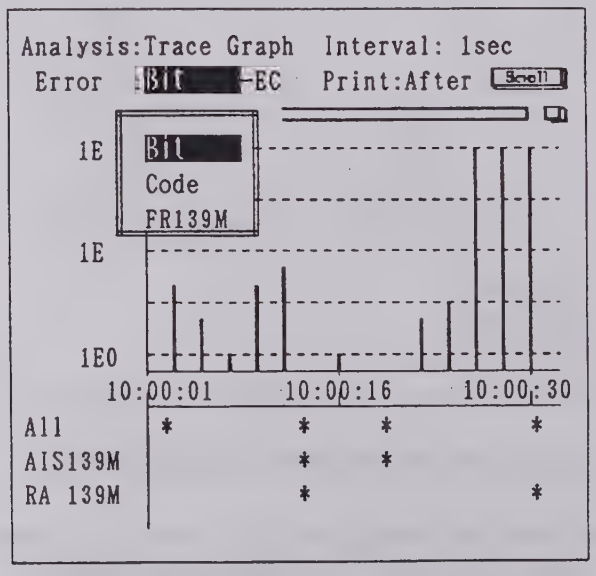


Fig. 5-41 Setting the Displayed Error Type

Note: ● *The table below lists the errors that can be set.*

If the MUX or DEMUX option is not installed, the settings in the DEMUX OFF columns are adopted.

Receive section bit rate	139 Mb/s				
DEMUX final Tributary	DEMUX OFF	34 M	8 M	2 M	64 k
Bit	◎	◎	◎	◎	◎
Code	○	○	○	○	○
FRM 139 M	△	○	○	○	○
FRM 34 M		△	○	○	○
FRM 8 M			△	○	○
FRM 2 M				△	○
CRC-4				▲	●

Receive section bit rate	34 Mb/s			
DEMUX final Tributary	DEMUX OFF	8 M	2 M	64 k
Bit	◎	◎	◎	◎
Code	○	○	○	○
FRM 139 M				
FRM 34 M	△	○	○	○
FRM 8 M		△	○	○
FRM 2 M			△	○
CRC-4			▲	●

Receive section bit rate	8 Mb/s			2 Mb/s	
DEMUX final Tributary	DEMUX OFF	2 M	64 k	DEMUX OFF	64 k
Bit	◎	◎	◎	◎	◎
Code	○	○	○	○	○
FRM 139 M					
FRM 34 M					
FRM 8 M	△	○	○		
FRM 2 M		△	○	△	○
CRC-4		▲	●	▲	●

Notes: ○: *Can be set*
◎ : *Can be set when out-of-service is selected.*
△ : *Can be set when frame is on.*
● : *Can be set when CRC-4 is on.*
▲ : *Can be set when frame and CRC-4 are both on.*

(2) Setting the displayed error measurement format:

Sets the measurement format of the error displayed in bar graph format.

Setting ranges are as follows:

[Setting ranges] EC: Displays the error in error count format.
ER: Displays the error in error ratio format.

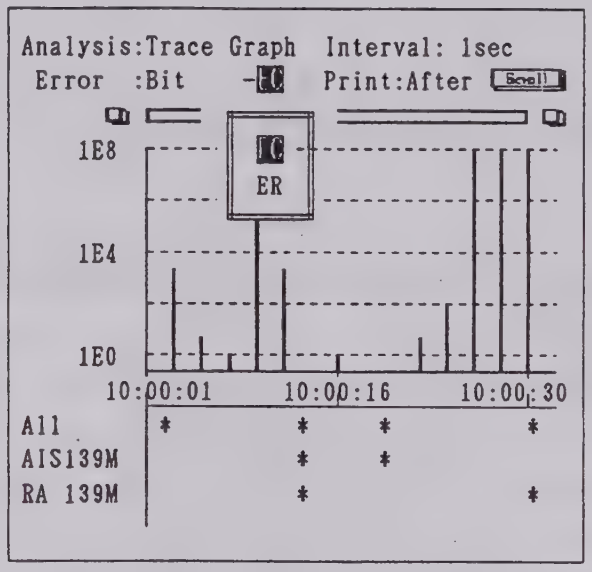


Fig. 5-42 Setting the Displayed Error Format (EC)

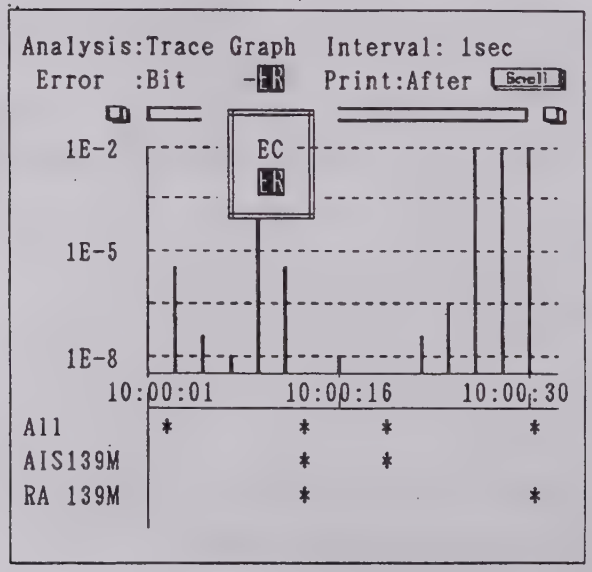


Fig. 5-43 Setting the Displayed Error Format (ER)

5.5.4 Bar graph printing range

This sets the printing range for bar graph printing to a printer.

[Settable items] The following item can be set:

- Setting the bar graph printing range

(1) Setting the bar graph printing range:

Sets the range of the bar graph to be printed to a printer. Use the Copy key for printing.

[Setting ranges]
- Dspl: Prints the range displayed on the screen.
- All: Prints the entire range.
- After: Prints the range displayed on the screen and what follows.
- Before: Prints the range displayed on the screen and what is before it.

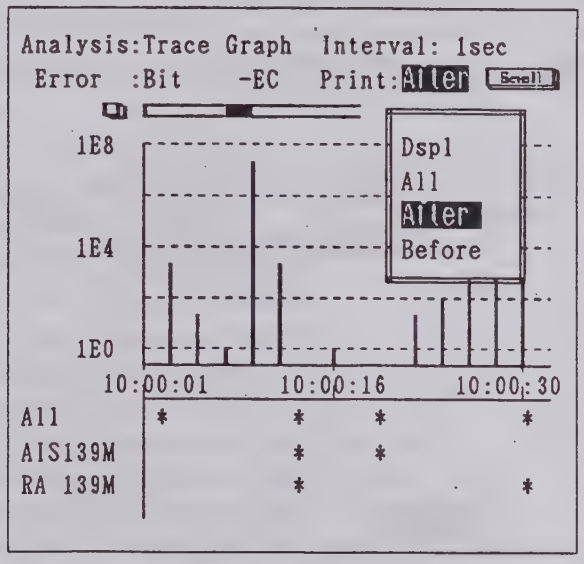


Fig. 5-44 Setting the Bar Graph Printing Range

Notes:
- *If After or Before is specified, the range displayed on the screen is also printed.*
- *See paragraph 5.14.1 for printing examples.*

5.5.5 Bar graph display start time

This sets the bar graph start time.

[Settable items] The following item can be set:

- The bar graph display start time

(1) Setting the bar graph display start time:

Specifies the bar graph display start time. The display on the screen changes according to the set bar graph interval. Set a year, month, day, hour, minute, and second.

Setting ranges are as follows:

[Setting ranges] Year-Month-Day hour:min:sec

Year:	An integer from 00 to 99
Month:	An integer from 01 to 12
Day:	An integer from 01 to 31
hour:	An integer from 00 to 23
min:	An integer from 00 to 59
sec:	An integer from 00 to 59

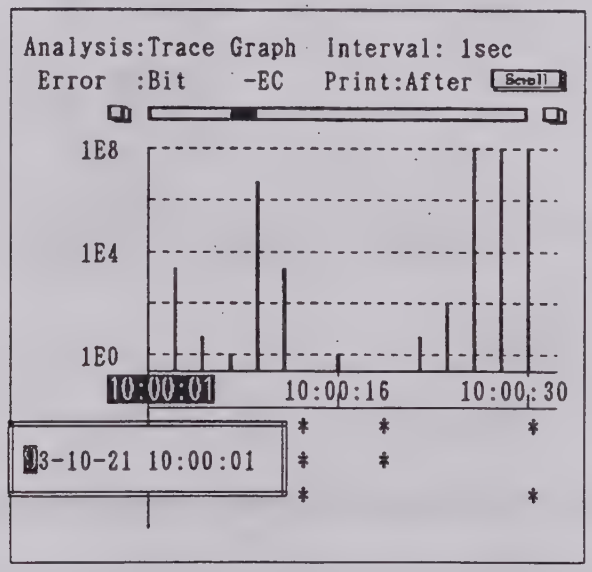


Fig. 5-45 Setting the Bar Graph Display Start Time

Notes:

- *If a time other than a measurement time is specified, NO DATA is displayed.*
- *A nonexistent data cannot be set*
- *Specify the two lower digits of the year. A specification of 00 means the year 2000.*

5.5.6 Displayed alarm

Up to three types of alarms to be displayed can be set.

[Settable items] The following item can be set:

- The display alarm

[Related items] The following items affect this setting:

- Bit rate of receiver section
- Receiver section frame
- DEMUX (option)
- 2M signaling (set on the Setup:Measure screen explained in paragraph 5.7)
- Service state (In-service/Out-of-service, set on the Setup:Measure screen explained in paragraph 5.7)

(1) Setting the display alarm:

Sets up to three types of alarms to be displayed.

If one or more alarm occurs in the time specified as a bar graph interval, an asterisk (*) is displayed.

Setting ranges are as follows:

[Setting ranges]

All:	Indicates when any kind of alarm occurs.
Power:	Displays a power-off alarm.
LOS:	Displays a signal-off alarm.
AIS 139M:	Displays 139M AIS.
AIS 34M:	Displays 34M AIS.
AIS 8M:	Displays 8M AIS.
AIS 2M:	Displays 2M AIS.
LOF 139M:	Displays the 139M frame loss.
LOF 34M:	Displays the 34M frame loss.
LOF 8M:	Displays the 8M frame loss.
LOF 2M:	Displays the 2M frame loss.
LOF MF:	Displays the 2M signaling multiframe loss.
RA 139M:	Displays the 139M remote alarm.
RA 34M:	Displays the 24M remote alarm.
RA 8M:	Displays the 8M remote alarm.
RA 2M:	Displays the 2M remote alarm.
RA MF:	Displays the 2M multiframe remote alarm.
Patt:	Displays a pattern loss.

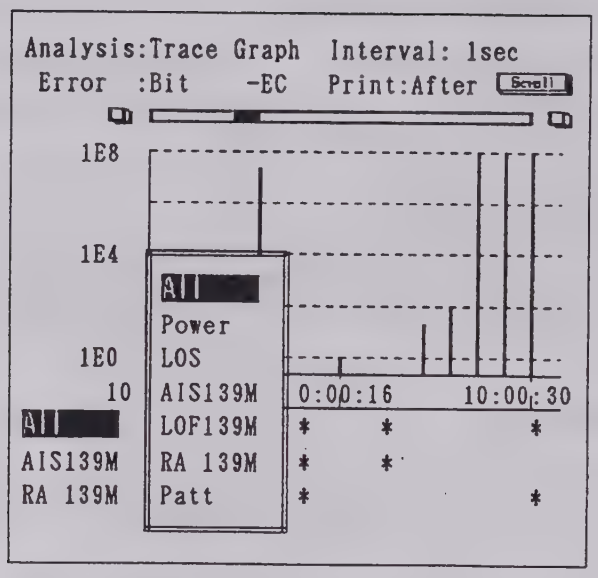


Fig. 5-46 Setting the Displayed Alarm

Note: • *The alarms listed in the table below can be set.*
If neither the MUX nor DEMUX option is installed, the settings in the DEMUX OFF columns are adopted.

Receive section bit rate	139 Mb/s				
DEMUX final Tributary	DEMUX OFF	34 M	8 M	2 M	64 k
AIS 139 M	○	○	○	○	○
AIS 34 M		○	○	○	○
AIS 8 M			○	○	○
AIS 2 M				○	○
LOF 139 M/RA 139 M	△	○	○	○	○
LOF 34 M/RA 34 M		△	○	○	○
LOF 8 M/RA 8 M			△	○	○
LOF 2 M/RA 2 M				△	○
LOF MF/RA MF				▲	●
Patt	◎	◎	◎	◎	◎

Receive section bit rate	34 Mb/s			
DEMUX final Tributary	DEMUX OFF	8 M	2 M	64 k
AIS 139 M				
AIS 34 M	○	○	○	○
AIS 8 M		○	○	○
AIS 2 M			○	○
LOF 139 M/RA 139 M				
LOF 34 M/RA 34 M	△	○	○	○
LOF 8 M/RA 8 M		△	○	○
LOF 2 M/RA 2 M			△	○
LOF MF/RA MF			▲	●
Patt	◎	◎	◎	◎

Receive section bit rate	8 Mb/s			2 Mb/s	
DEMUX final Tributary	DEMUX OFF	2 M	64 k	DEMUX OFF	64 k
AIS 139 M	○	○	○	○	○
AIS 34 M		○	○	○	○
AIS 8 M			○	○	○
AIS 2 M				○	○
LOF 139 M/RA 139 M	△	○	○	○	○
LOF 34 M/RA 34 M		△	○	○	○
LOF 8 M/RA 8 M			△	○	○
LOF 2 M/RA 2 M				△	○
LOF MF/RA MF		▲	●	▲	●
Patt	◎	◎	◎	◎	◎

Notes: ○ : *Can be set*
◎ : *Can be set when out-of-service is selected*
△ : *Can be set when frame is on*
● : *Can be set when signaling is on*
▲ : *Can be set when frame and signaling are both on*
Other alarms (ALL, Power, and LOS)not listed in this table can always be set.

5.5.7 Scrolling the bar graph

This scrolls the displayed bar graph.

[Items set] The following items can be set:

- Moving to the beginning of the bar graph
- Moving to the end of the bar graph
- Horizontal scroll

(1) Moving to the beginning of the bar graph:

Displays the bar graph so that the beginning of the graph is at the left of the screen.

Press the Set key while the inverted cursor is over the button icon on the left of the scroll bar.

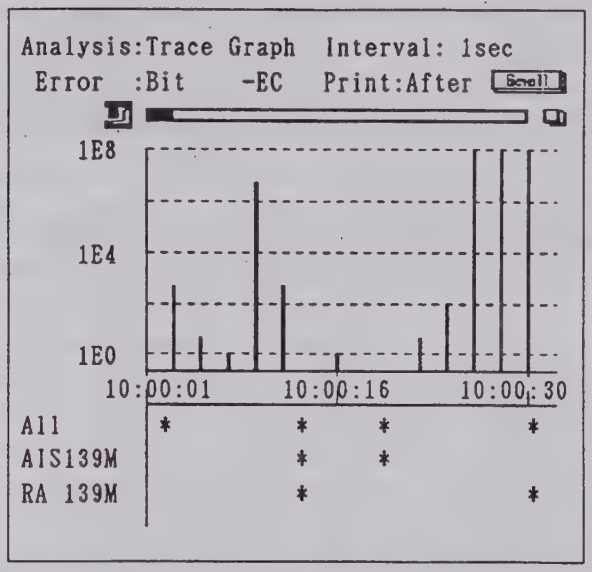


Fig. 5-47 Moving to the Beginning of the Bar Graph

Note: The beginning of the bar graph is a measurement start time.

(2) Moving to the end of the bar graph:

Displays the bar graph so that the end of the graph is at the left of the screen.

Press the Set key while the inverted cursor is over the button icon on the right of the scroll bar.

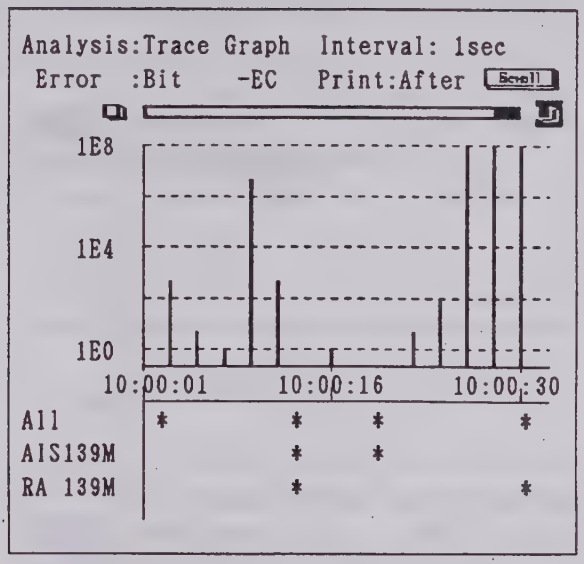


Fig. 5-48 Moving to the End of the Bar Graph

Notes: *The end of the bar graph indicates one of the following times:*

- *If the memory is full, the end of the graph indicates time when the memory become full.*
- *The end of the graph indicates the current time during a measurement.*
- *If a measurement has ended, the end of the graph indicates the measurement time ended.*

(3) Horizontal scroll:

Horizontally scrolls the bar graph.

Move the inverted cursor to the scroll bar and press the Set key. The device enters the scroll state. In this state, press the ← or → key to scroll the bar graph horizontally. Press the Set key again to release the device from the scroll state. The ← and → keys can again be used to move the cursor.

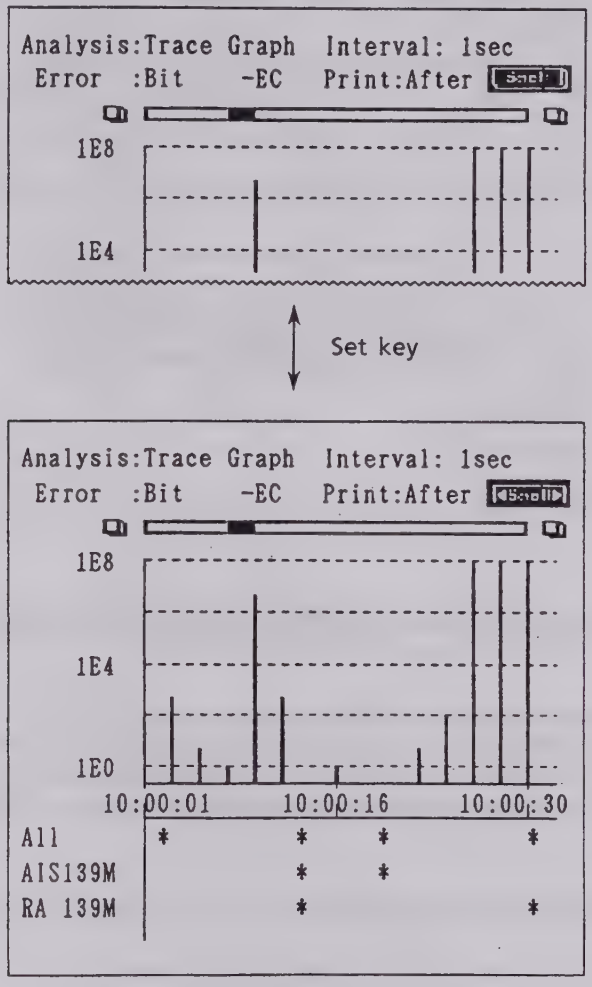


Fig. 5-49 Horizontal scroll

Note: *The ← or → key scrolls the bar graph in the same direction that the scroll bar display area moves. Therefore, the ← key moves the bar graph to the right.*

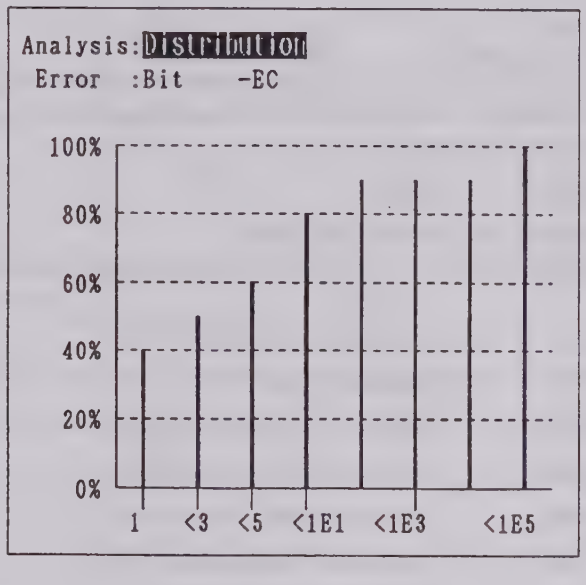
5.6 Settings on the Analysis:Distribution Screen

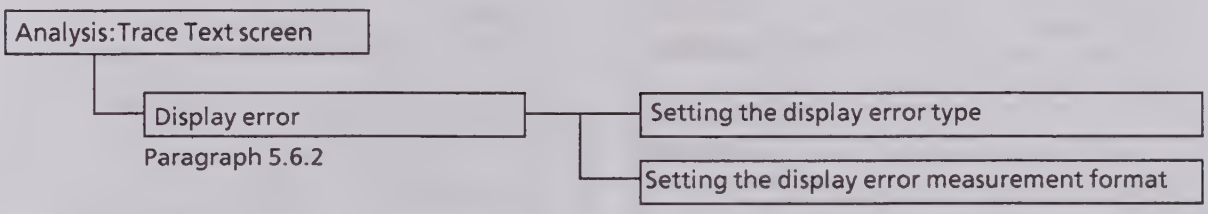
5.6.1 Functions

The error distribution during a measurement is displayed in bar graph format.

The error distribution in the specified period of the preceding measurement is displayed. When a new measurement starts, the data collected during the previous measurement is cleared.

The Analysis:Distribution screen and settings are as follows:





Note: *When a measured result value in one second is assumed to be one data item and all data items are assumed to be 100%, this function displays each data item distribution in bar graph format.*

5.6.2 Displayed error

This sets the type and measurement format of an error displayed in bar graph.

[Settable items] The following items can be set:

- The displayed error type
- The displayed error measurement format

[Related items] The following items affect this setting:

- Bit rate
- Frame
- DEMUX (option)
- CRC-4 ON/OFF (set on the Setup:Measure screen as explained in paragraph 5.7)
- Service state (In-service or Out-of-service set on the Setup:Measure screen as explained in paragraph 5.7)

(1) Setting the displayed error type:

Sets the type of the error displayed in bar graph format.

Setting ranges are as follows:

[Setting ranges]

Bit	: Displays a bit error.
Code	: Displays a code error.
FRM 139M	: Displays a 139M frame error.
FRM 34M	: Displays a 34M frame error.
FRM 8M	: Displays an 8M frame error.
FRM 2M	: Displays a 2M frame error.
CRC-4	: Displays a CRC-4 error.

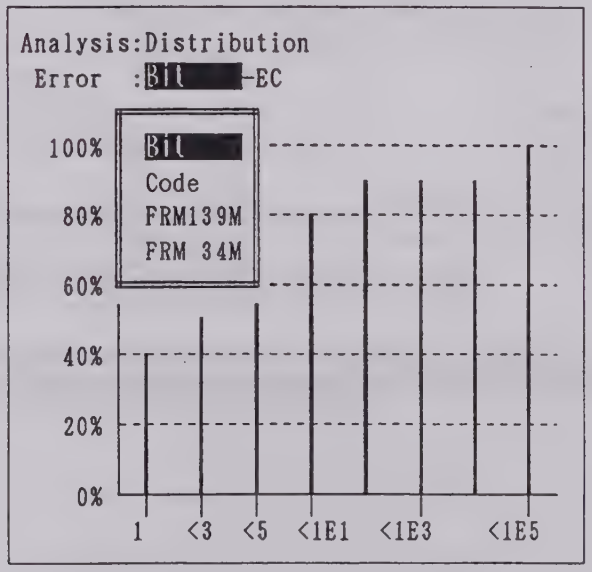


Fig. 5-50 Setting the Displayed Error Type

Note: ● *The table below lists the errors that can be set.*

If neither the MUX nor DEMUX option is installed, the settings in the DEMUX OFF columns are adopted .

Receive section bit rate	139 Mb/s				
DEMUX final Tributary	DEMUX OFF	34 M	8 M	2 M	64 k
Bit	◎	◎	◎	◎	◎
Code	○	○	○	○	○
FRM 139 M	△	○	○	○	○
FRM 34 M		△	○	○	○
FRM 8 M			△	○	○
FRM 2 M				△	○
CRC-4				▲	●

Receive section bit rate	34 Mb/s			
DEMUX final Tributary	DEMUX OFF	8 M	2 M	64 k
Bit	◎	◎	◎	◎
Code	○	○	○	○
FRM 139 M				
FRM 34 M	△	○	○	○
FRM 8 M		△	○	○
FRM 2 M			△	○
CRC-4			▲	●

Receive section bit rate	8 Mb/s			2 Mb/s	
DEMUX final Tributary	DEMUX OFF	2 M	64 k	DEMUX OFF	64 k
Bit	◎	◎	◎	◎	◎
Code	○	○	○	○	○
FRM 139 M					
FRM 34 M					
FRM 8 M	△	○	○		
FRM 2 M		△	○	△	○
CRC-4		▲	●	▲	●

Notes: ○ : *Can be set*
◎ : *Can be set in an out-of-service state*
△ : *Can be set when frame is on*
● : *Can be set when CRC-4 is on*
▲ : *Can be set when frame and CRC-4 are both on*

(2) Setting the displayed error measurement format:

Sets the measurement format of the error displayed in bar graph format.

Setting ranges are as follows:

[Setting ranges] EC : Displays the error in error count format.

ER : Displays the error in error ratio format.

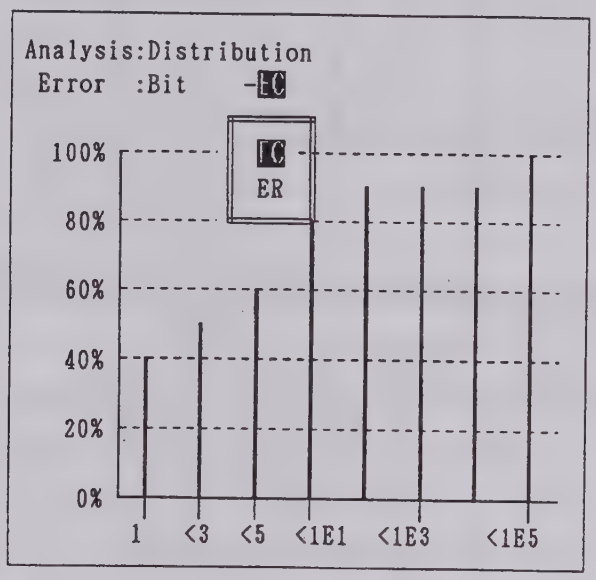


Fig. 5-51 Setting the Displayed Error Format (EC)

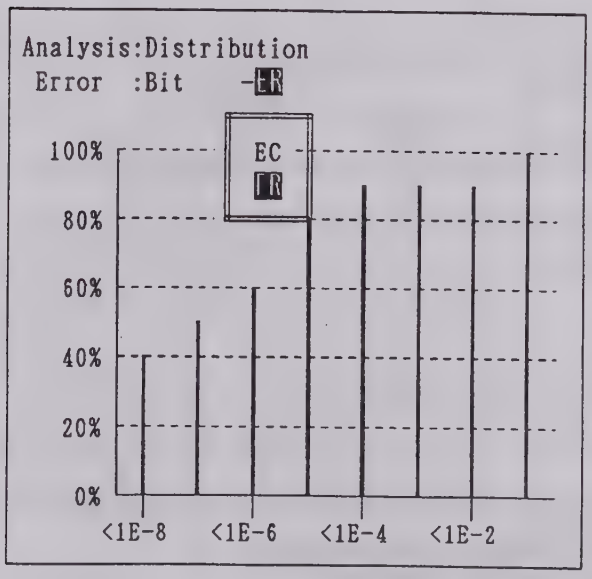


Fig. 5-52 Setting the Displayed Error Format (ER)

5.7 Settings on the Setup:Measure Screen

5.7.1 Functions

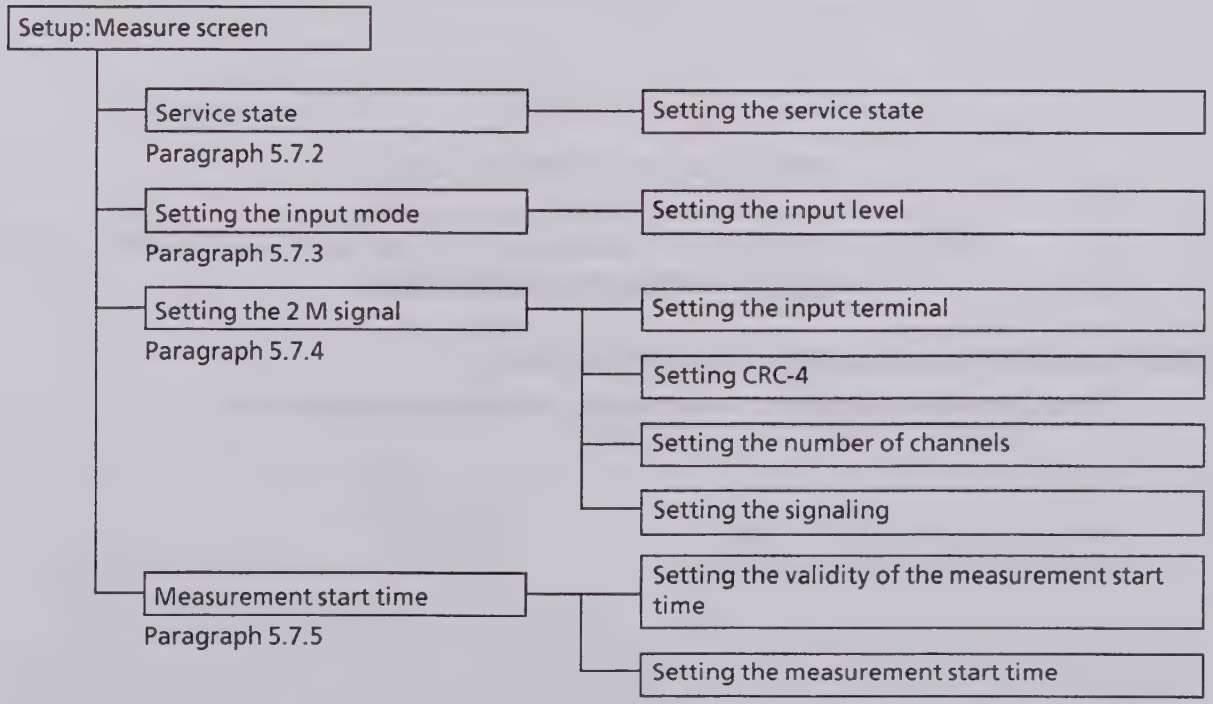
These set the measurement condition.

The measurement condition is mainly set on the Condtn screen, as explained in paragraph 5.2. Items that need not be changed frequently are explained in this paragraph.

The Setup:Measure screen and settings are as follows:

```
Setup:Measure

  Measuring mode    :In-service
  Input mode        :Term
  2M signal input   :Unbalanced
     CRC-4          :ON
     Channels       :30
     Signalling     :ON
  Program start     :ON  [10-01 10:00:00]
```



5.7.2 Service state

This sets the service state when a measurement is made.

[Settable item] The following item can be set:

- The service state

[Related items] This setting affects the following items:

- Bit error display
- Pattern sink loss alarm display
- Performance object frame

(1) Setting the service state:

Sets a service state for a measurement.

Setting ranges are as follows:

[Setting ranges] Out-of-service: Performs a measurement in an out-of-service state.

In-service: Performs a measurement in an in-service state.

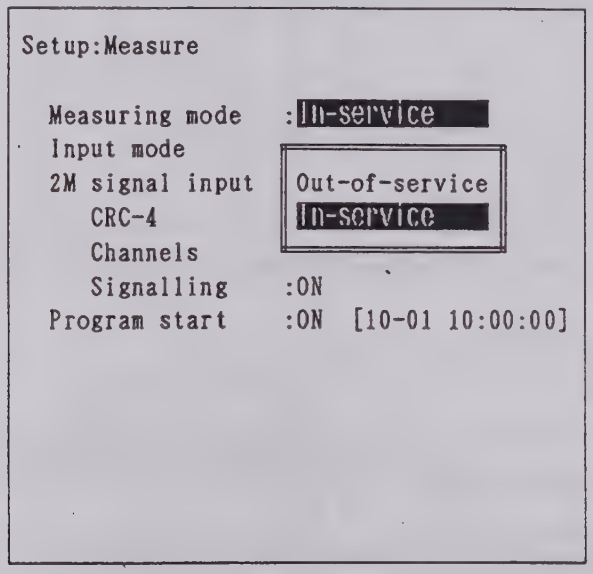


Fig. 5-53 Setting the Service State

Notes:
- *A bit error can be measured in an out-of-service state.*
- *If the setting is changed during a measurement, the measurement is restarted.*

5.7.3 Setting the input mode

This sets the input signal level.

[Settable item] The following item can be set:

- The input level

(1) Setting the input level:

Sets an input signal level.

Setting ranges are as follows:

[Setting ranges] Term : Use this range when connecting with the main output of the MP1520B directly or via the specified cable.

Mon : Use this range when connecting with the signal lower than the main output of the MP1520B by 20 dB directly or via the specified cable.

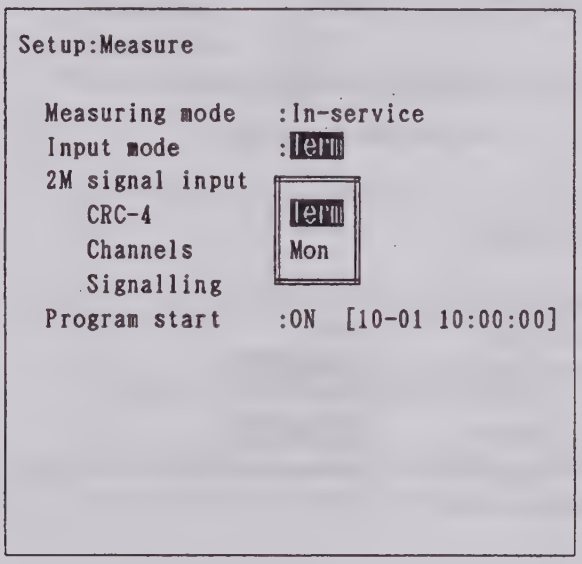


Fig. 5-54 Setting the Input Mode

Note: *If the setting is changed during a measurement, the measurement is restarted.*

5.7.4 Setting the 2 M signal

This sets the 2 M signal state.

[Settable item] The following items can be set:

- The input terminal
- CRC-4
- The number of channels
- The signaling

[Related items] This setting affects the following items:

- CRC-4 error display
- MUX or DEMUX channel (option)
- Alarm display related to multiframe

(1) Setting the input terminal:

Sets the input terminal used to measure the 2 M signal.

Setting ranges are as follows:

[Setting ranges] Unbalanced : Uses the unbalanced terminal.

Balanced : Uses the balanced terminal.

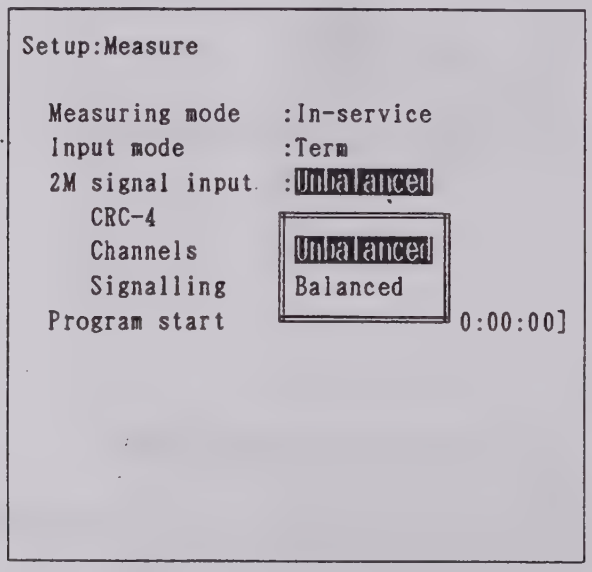


Fig. 5-55 Setting the Input Terminal

Notes:
- *If the bit rate of the receiver section is not 2 Mb/s, this setting is ignored.*
- *When signals of 2 Mb/s are sent, they are output from both unbalanced and balanced terminals.*
- *If the setting is changed during a measurement, the measurement is restarted.*

(2) Setting CRC-4:

Sets whether to add a CRC-4 error to the 2 M send signal and whether to measure the CRC-4 error of the 2 M receive signal.

Setting ranges are as follows:

[Setting ranges] OFF : Does not use a CRC-4 error.

ON : Uses a CRC-4 error..

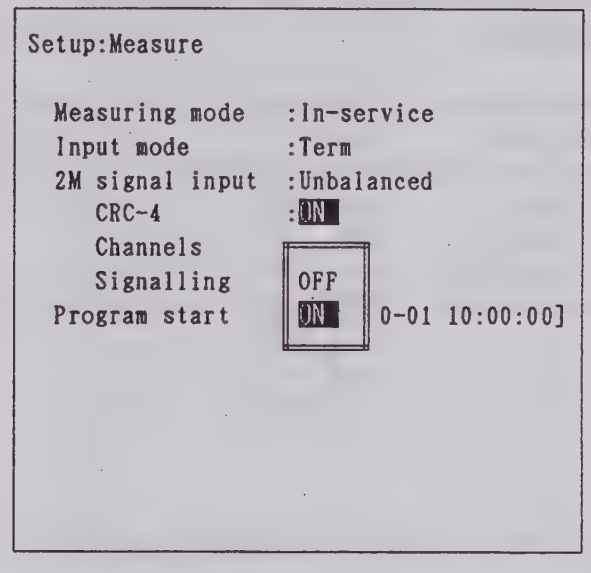


Fig. 5-56 Setting the CRC Check

Note: *If the setting is changed during a measurement, the measurement is restarted.*

(3) Setting the number of channels:

Sets the number of 64 k channels when a frame is added to the 2 M signal.

Setting ranges are as follows:

[Setting ranges] 30 : Sets thirty channels.

31 : Sets thirty-one channels.

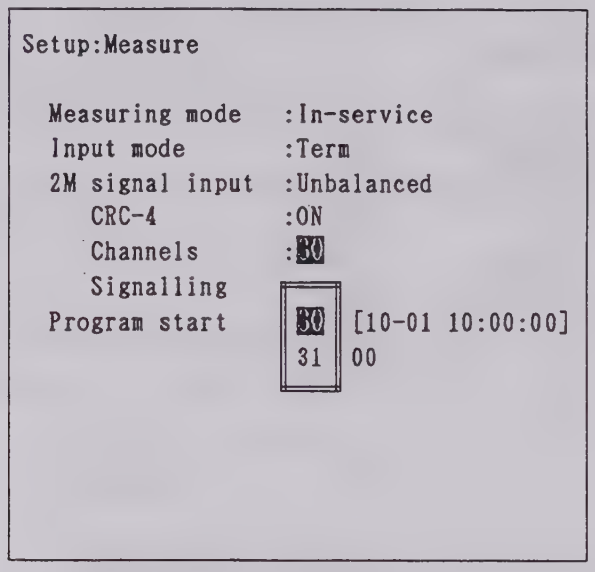


Fig. 5-57 Setting the Number of Channels

Notes:
- *The set number of channels is the maximum number of 64 k channels when MUX or DEMUX (option) is set to ON.*
- *If the setting is changed during a measurement, the measurement is restarted.*

(4) Setting the signaling:

Sets whether to add a signaling multiframe to the 2 M signal.

Setting ranges are as follows:

[Setting ranges] OFF : Turns the signaling multiframe off.
ON : Turns the signaling multiframe on.

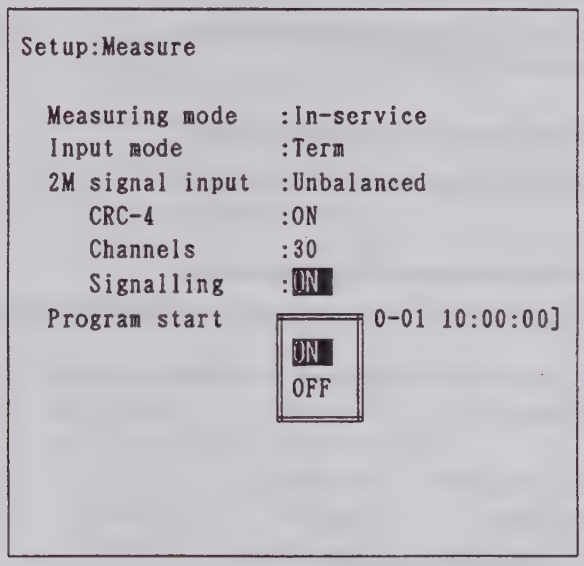


Fig. 5-58 Setting the Signaling

Notes:
- *When the number of channels is set to 30, this item can be set to on.*
- *If the signaling multiframe is set to off, the multiframe loss and the multiframe remote alarm are not displayed.*
- *If the setting is changed during a measurement, the measurement is restarted.*

5.7.5 Measurement start time

This sets the measurement start time.

Use this function to start a measurement from a scheduled time.

This function is valid when no measurement is being performed, and when the set time is later than the current time.

[Settable item] The following items can be set:

- The validity of the measurement start time
- The measurement start time

(1) Setting the validity of the measurement start time:

Sets whether to validate the automatic measurement start function.

Setting ranges are as follows:

[Setting ranges] OFF : Starts a measurement automatically.

ON : Starts a measurement automatically when the set time comes.

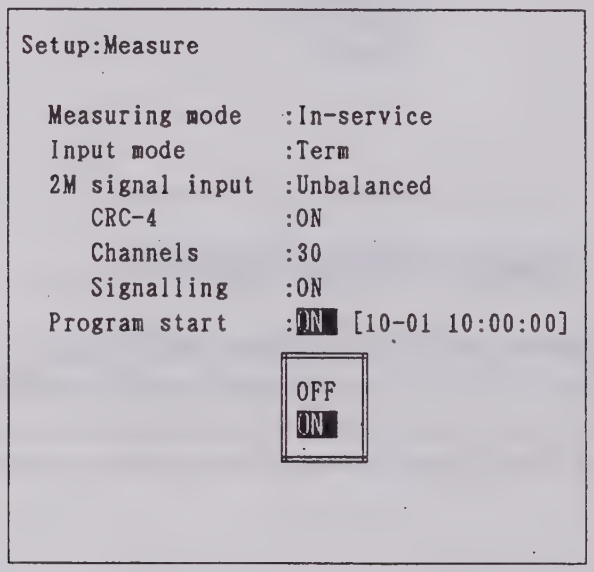


Fig. 5-59 Setting the Validity of the Measurement Start Time

Notes:
- *If the set time comes during a measurement, the measurement being performed has priority, and the automatic measurement function does not operate.*
- *When the set time comes, the measurement starts and the setting is set to OFF.*

(2) Setting the measurement start time:

Sets the time at which the automatic measurement function starts. This item is normally displayed in the format of month, day, minute, and second on the screen. However, a year can also be specified.

Setting ranges are as follows:

[Setting ranges] Year-Month-Day hour:min:sec

Year : An integer from 00 to 99
Month : An integer from 01 to 12
Day : An integer from 01 to 31
hour : An integer from 00 to 23
min : An integer from 00 to 59
sec : An integer from 00 to 59

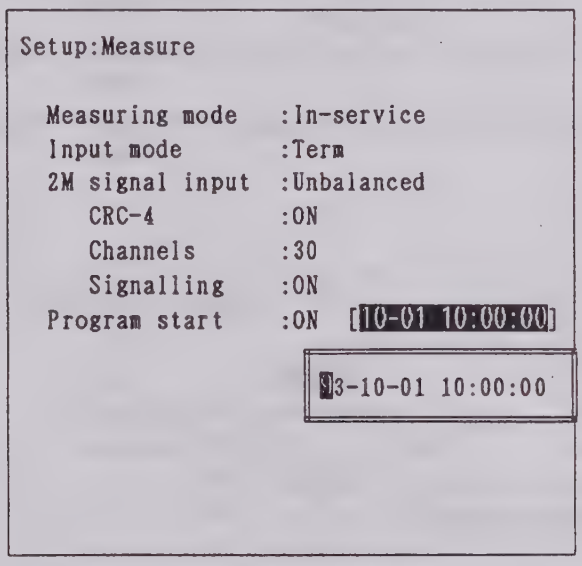


Fig. 5-60 Setting the Measurement Start Time

Notes: • *This item can be set when the measurement start time is set to ON.*

• *A nonexistent date cannot be set.*

• *Specify a year in the two lower digits. A specification of 00 means the year 2000.*

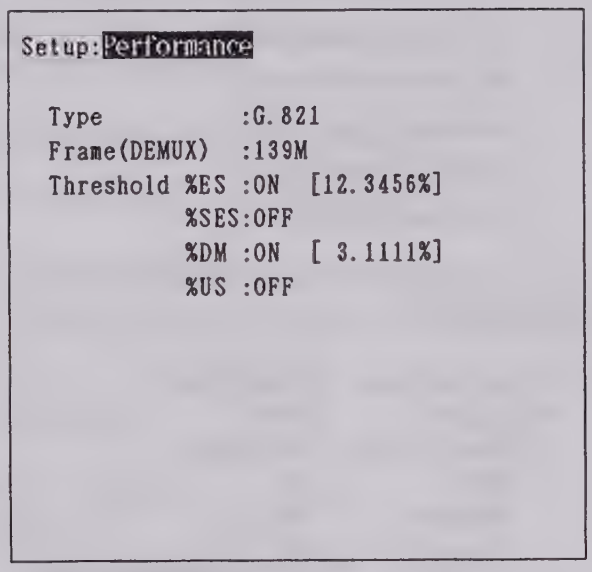
5.8 Settings on the Setup:Performance Screen

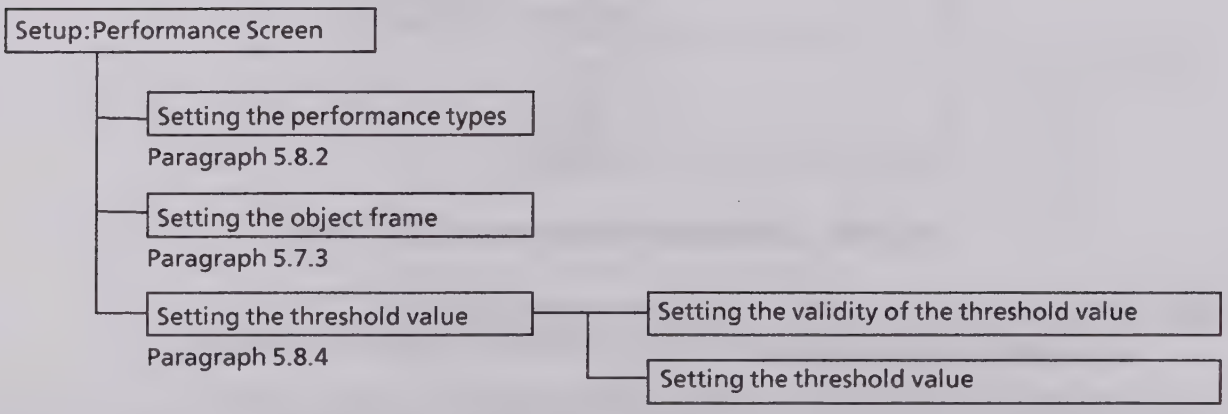
5.8.1 Functions

Performance measurement conditions are set.

A measured value is displayed on the Result screen.

The Setup:Performance screen and settings are as follows:





5.8.2 Setting the performance type

Set a performance type.

[Settable item] The following item can be set:

- Performance type

[Settable item] This setting affects the following item:

- Performance display

(1) Setting the performance type:

Sets the type of the performance to be measured.

The setting ranges are as follows:

[Setting ranges] OFF : Does not measure any performance.

G.821 : Measures the performance in accordance with ITU-T recommendation G.821.

G.826 : Measures the performance in accordance with ITU-T recommendation G.826.

M2100 : Measures the performance in accordance with ITU-T recommendation M.2100.

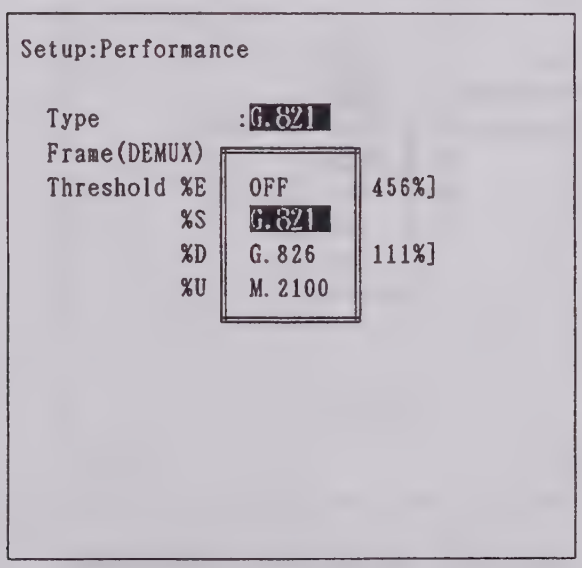


Fig. 5-61 Setting the Performance Type

Note: *If the setting is changed during a measurement, the measurement is restarted.*

5.8.3 Setting the object frame

Set the frame for a performance measurement.

[Settable item] The following item can be set:

- Setting the object frame

[Settable item] This setting affects the following item:

- Performance display

(1) Setting the object frame:

Specifies the frame to be the performance measurement object when the in-service measurement is set and DEMUX (option) is set to ON.

If DEMUX is set to OFF, an input signal frame is selected regardless of this display.

Setting ranges are as follows:

[Setting ranges] 139M : Sets the 139M frame
34M : Sets the 34M frame.
8M : Sets the 8M frame.
2M : Sets the 2M frame.

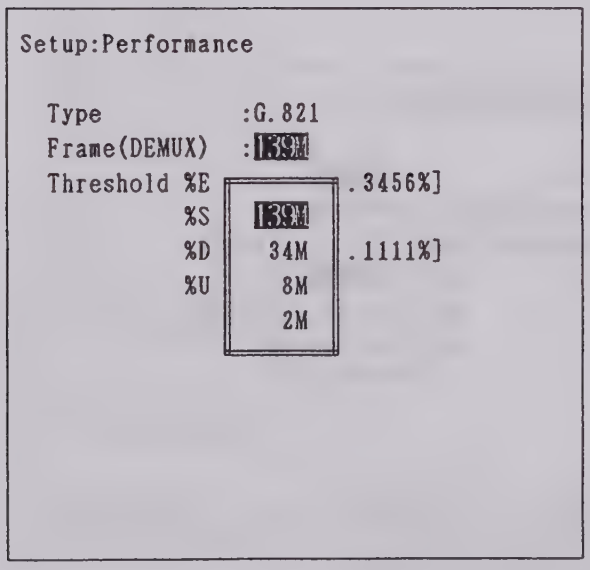


Fig. 5-62 Setting the Object Frame

Notes:
- *If the MUX or DEMUX option is not installed or DEMUX is set to OFF during the out-of-service measurement, this item is nWhen the performance type is set to a status other than off, this item can be set.ot displayed.*
- *When the performance type is set to a status other than off, this item can be set.*
- *In the in-service measurement the performance measurement errors are as follows:*

<table>
<tr><td rowspan="2">Performance type</td><td rowspan="2">139M</td><td rowspan="2">34M</td><td rowspan="2">8M</td><td colspan="2">CRC ON</td></tr>
<tr><td>CRC OFF</td><td>CRC ON</td></tr>
<tr><td>G.821</td><td colspan="3" rowspan="3">Frame error</td><td rowspan="3">CRC error</td></tr>
<tr><td>G.826</td></tr>
<tr><td>M.2100</td></tr>
</table>

- *If the setting is changed during a measurement, the measurement is restarted.*

5.8.4 Setting the threshold value

Evaluation is done using the threshold value of the performance measurement. A threshold value can be set for each measurement item.

[Settable item] The following items can be set:

- The validity of the threshold value
- The threshold value

[Related item] These settings affect the following item:

- Performance display

(1) Setting the validity of the threshold value:

Sets whether to evaluate the performance measurement using a threshold value.

The setting ranges are as follows:

[Setting ranges] OFF : Does not evaluate the performance measurement.

ON : Evaluates the performance measurement.

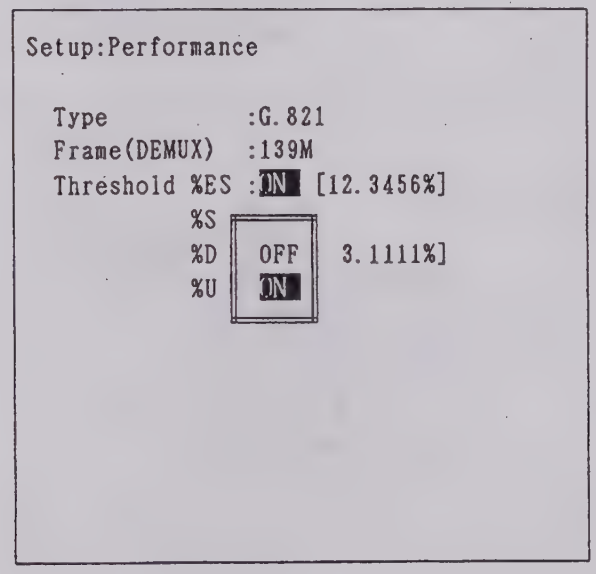


Fig. 5-63 Evaluating the Validity of the Threshold Value

Note: *If all items are set to OFF, no evaluation result is displayed when a performance is displayed on the Result screen.*

(2) Setting the threshold value:

Sets a threshold value to evaluate a performance measurement.

The setting ranges are as follows:

[Setting ranges] For the G.821 performance:

%ES : 0.0000 to 99.999/0.001 steps
%SES : 0.0000 to 99.999/0.001 steps
%DM : 0.0000 to 99.999/0.001 steps
%US : 0.0000 to 99.999/0.001 steps

For the G.826 performance:

ESR : 1.00E-06 to 9.99E-01/Mantissa: 0.01 steps
Exponent: 1 steps
SESR : 1.00E-06 to 9.99E-01/Mantissa: 0.01 steps
Exponent: 1 steps
BBER : 1.00E-06 to 9.99E-01/Mantissa: 0.01 steps
Exponent: 1 steps
%US : 0.0000 to 9.9999/ 0.0001 steps

For the M.2100 performance:

ES S1 : A integer from 0 to 99998
ES S2 : A integer from 1 to 99999
SES S1 : A integer from 0 to 99998
SES S2 : A integer from 1 to 99999

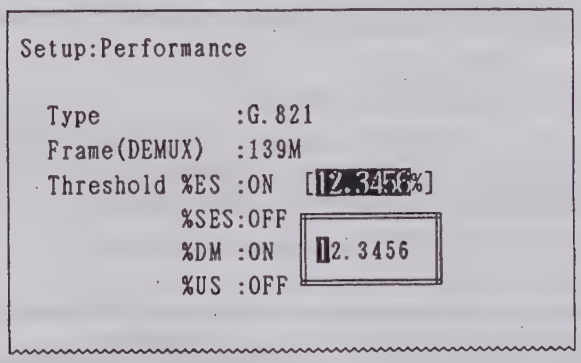


Fig. 5-64 Setting the Threshold Value (for the G.821 Performance)

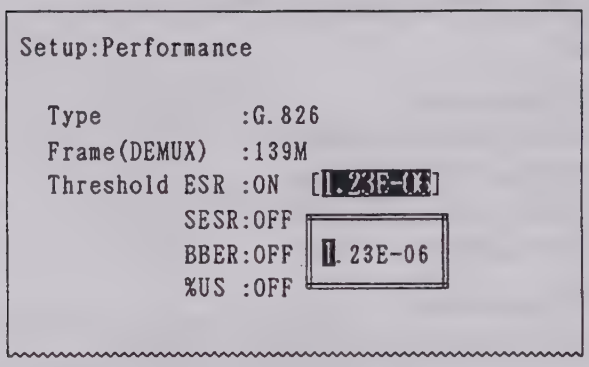


Fig. 5-65 Setting the Threshold Value (for the G.826 Performance)

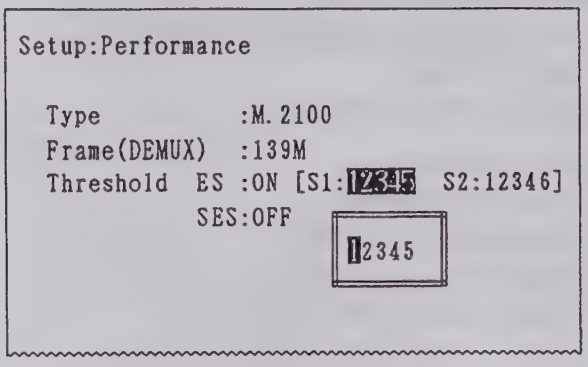


Fig. 5-66 Setting the Threshold Value (for the M.2100 Performance)

Notes:
- *This item can be set when the threshold is set to on.*
- *For the M.2100 performance, if the value set in S2 is less than or equal to the value in S1, the value in S2 is changed to the value in S1 plus 1. If the value set in S1 is greater than or equal to the value in S2, the value in S2 is changed to the value in S1 plus 1.*
- *The following tables list evaluation displays on the Result screen.*

<For G.821 or G.826>

Evaluation display	Condition
Acceptable	Measured value ≦ threshold value
Unacceptable	Threshold value < measured value

If the %ES, %SES, %DM, and %US (G.821) evaluations are different from the ESR, SESR, BEER, and %US (G.826) evaluations, the worse evaluations are displayed.

<For M.2100>

Evaluation display	Condition
Acceptable	Measured value < S1 value
Degraded	S1 value ≦ measured value ≦ S2 value
Unacceptable	S2 value < measured value

If the ES and SES evaluations are different, the worst evaluation is displayed.

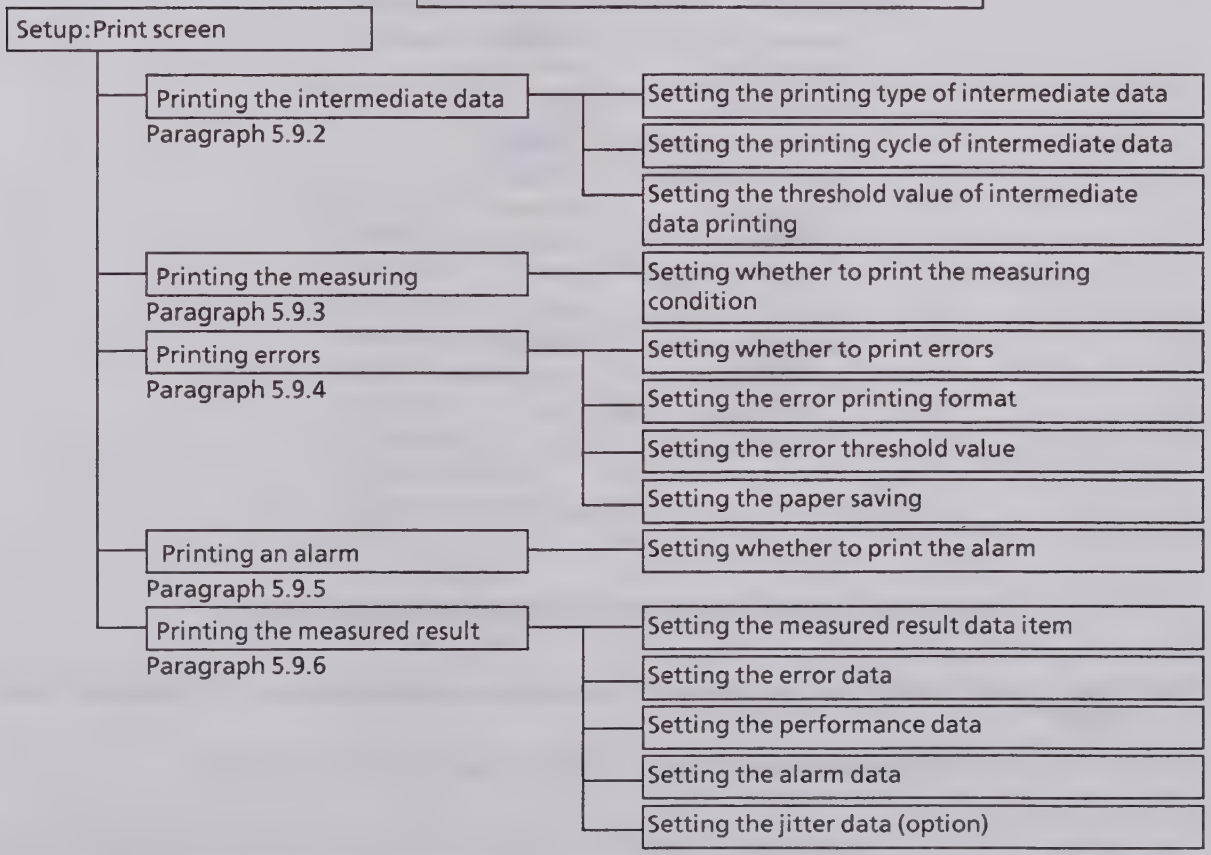
5.9 Settings on the Setup:Print Screen

5.9.1 Functions

These set the automatic printing conditions.

The Setup:Print screen and settings are as follows:

```
Setup:Print
  Intermediate data     :Indv  [ 1 hours]
    Threshold           :Error/Alarm
  Print items
    Measuring condition:ON
    Error occurrence    :ON
      Format            :EC
      Threshold         :>1000
      Paper saving      :OFF
    Alarm occurrence    :OFF
    Measured data       :Select
      Error data        :All
      Performance data  :OFF
      Alarm data        :ON
      Jitter data       :OFF
```


Setup:Print screen
Printing the intermediate data
Paragraph 5.9.2
Setting the printing type of intermediate data
Setting the printing cycle of intermediate data
Setting the threshold value of intermediate data printing
Printing the measuring
Paragraph 5.9.3
Setting whether to print the measuring condition
Printing errors
Paragraph 5.9.4
Setting whether to print errors
Setting the error printing format
Setting the error threshold value
Setting the paper saving
Printing an alarm
Paragraph 5.9.5
Setting whether to print the alarm
Printing the measured result
Paragraph 5.9.6
Setting the measured result data item
Setting the error data
Setting the performance data
Setting the alarm data
Setting the jitter data (option)

Notes: • *When operating the automatic printing function, enable the printer.*
• *See paragraph 5.14.2 for printing examples.*
• *The "Jitter data" on the lower-most line is indicated only when the jitter generation/measurement option is installed.*

5.9.2 Printing the intermediate data

An intermediate result can be printed during a measurement.

[Settable items] The following items can be set:

- The printing type of intermediate data
- The printing cycle of intermediate data
- The threshold value of intermediate data printing

(1) Setting the printing cycle of intermediate data:

Sets the printing cycle of intermediate data.

Setting ranges are as follows:

[Setting ranges]

OFF : Does not print intermediate data.

Indv : Prints a measured value from when the preceding intermediate data is printed (or from a measurement start point when first intermediate data is printed).

Accum : Prints a measured value accumulated from a measurement start.

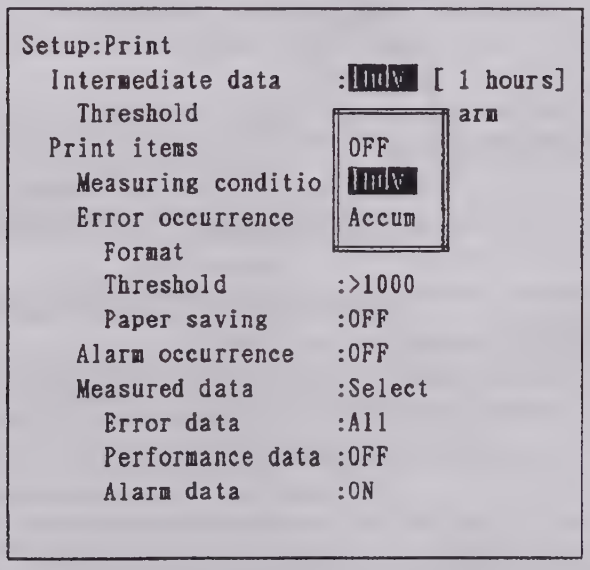


Fig. 5-67 Setting Whether to Print the Intermediate Data

Note: Items printed as intermediate data are the same as the set printing items of the measured result data.

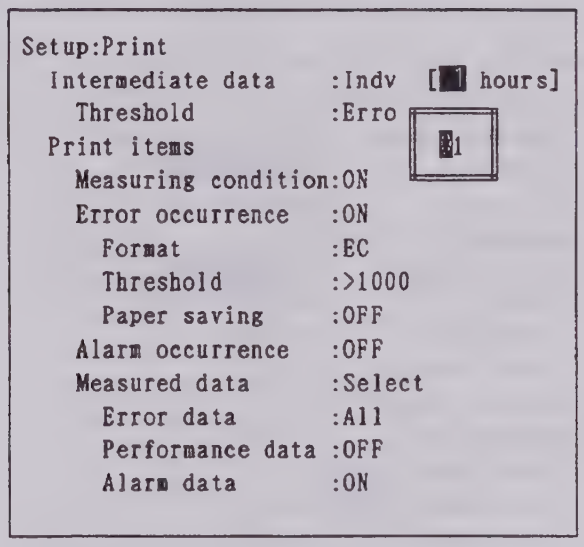
(2) Setting the printing cycle of intermediate data:

Sets the printing cycle of intermediate data.

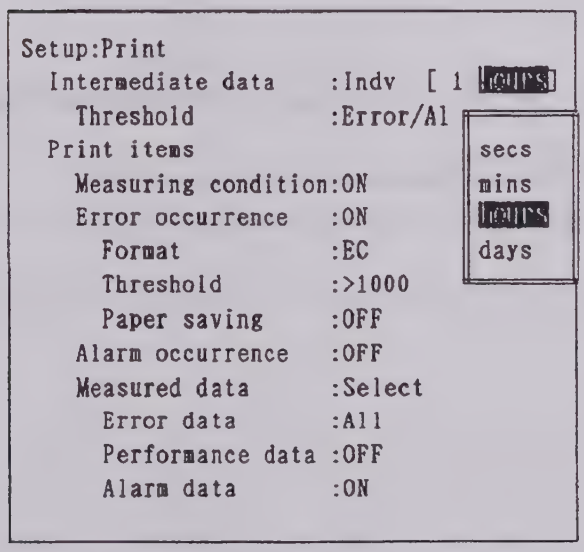
Setting ranges are as follows:

[Setting ranges]

- An integer from 1 to 99 secs
- An integer from 1 to 99 mins
- An integer from 1 to 99 hours
- An integer from 1 to 99 days



(1)



(2)

Fig. 5-68 Setting the Printing Cycle of Intermediate Data

Notes:
- *This item can be set when the intermediate data printing is set to ON.*
- *If a set measurement time is less than the cycle set in this item, intermediate data is not printed.*
- *If the setting conditions are changed during measurement, the measurement restarts.*

(3) Setting the threshold value of intermediate data printing:

Set a threshold value for intermediate data printing.

Setting ranges are as follows:

[Setting ranges] OFF : Prints intermediate data.

Error/Alarm: Prints from the preceding intermediate data printing (or from a measurement start if there is no intermediate data) when one or more errors have occurred for either Indv or Accum.

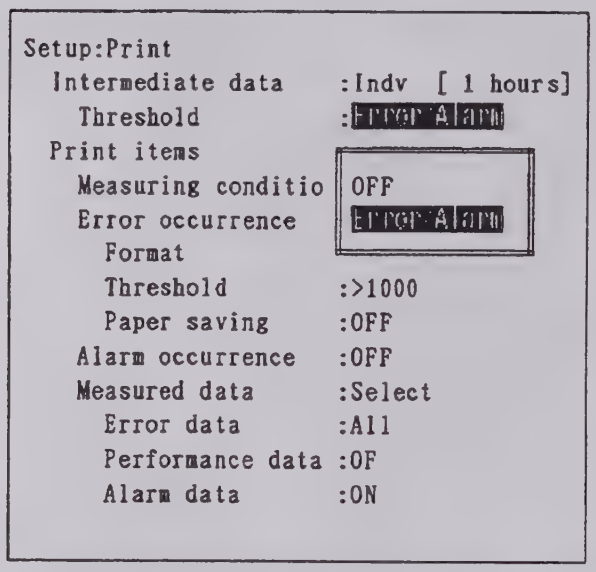


Fig. 5-69 Setting the Threshold Value of Intermediate Data Printing

Note: *This item can be set when the intermediate data printing is set to ON.*

5.9.3 Printing the measuring condition

The measuring condition can be printed when a measurement is started.

[Settable item] The following item can be set:

- Whether to print the measuring condition

(1) Setting whether to print the measuring condition:

Sets whether to print the measuring condition when a measurement is started.

Setting ranges are as follows:

[Setting ranges] OFF : Does not print the measuring condition.

ON : Prints the measuring condition.

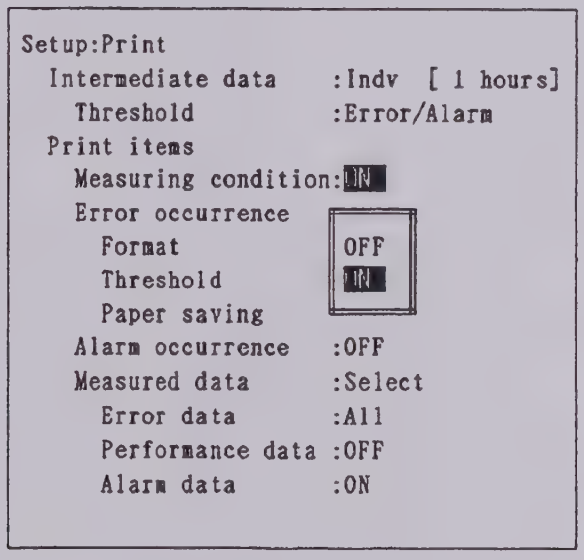


Fig. 5-70 Setting Whether to Print the Measuring Condition

Note: • *When a repeat measurement is specified, the measuring condition is printed only when the first measurement starts.*

5.9.4 Printing the errors

During a measurement, errors are printed when they occur.

[Settable item] The following items can be set:

- Whether to print the errors
- The error printing format
- The error threshold value
- Paper saving

(1) Setting whether to print the errors:

Sets whether to print errors that occur during a measurement.

Setting ranges are as follows:

[Setting ranges] OFF : Does not print the errors.

ON : Prints the errors.

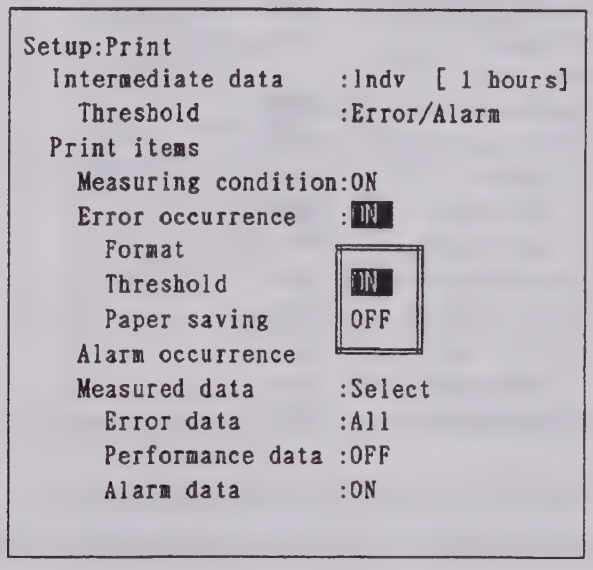


Fig. 5-71 Setting Whether to Print the Errors

(2) Setting the error printing format:

Sets the printing format of errors that occur during a measurement.

Setting ranges are as follows:

[Setting ranges] EC : Prints the error value in one second in error count format.

ER : Prints the error value in one second in error ratio format.

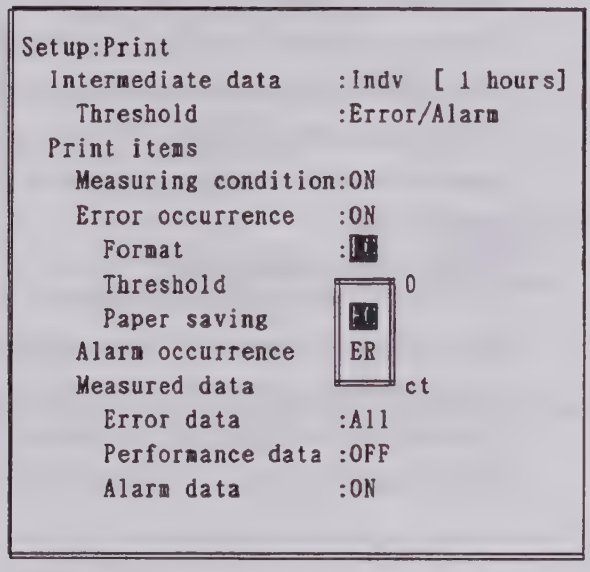


Fig.72 Setting the Error Printing Format

Note: *This item can be set when the error printing is set to ON.*

(3) Setting the error threshold value:

When an error that occurs during a measurement is printed, a threshold value can be set. A threshold value in one second is used.

Setting ranges are as follows:

[Setting ranges] For error count printing format:

OFF	:	Does not set a threshold value. An error is always printed when it occurs.
>1	:	If two or more errors occur, they are printed.
>10	:	If more than 10 errors occur, they are printed.
>100	:	If more than 100 errors occur, they are printed.
>1000	:	If more than 1000 errors occur, they are printed.

For error ratio printing format:

OFF	:	Does not set a threshold value. An error is always printed when it occurs.
>1E−3	:	If the error ratio exceeds 10^{-3}, the errors are printed.
>1E−4	:	If the error ratio exceeds 10^{-4}, the errors are printed.
>1E−5	:	If the error ratio exceeds 10^{-5}, the errors are printed.
>1E−6	:	If the error ratio exceeds 10^{-6}, the errors are printed.

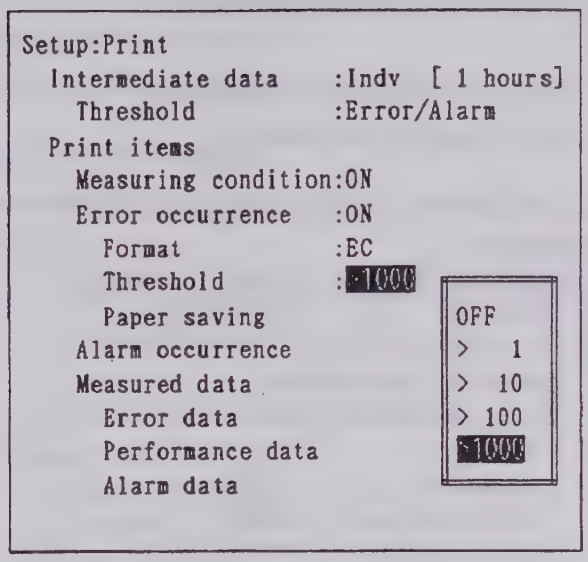


Fig. 5-73 Setting the Error Threshold Value (EC)

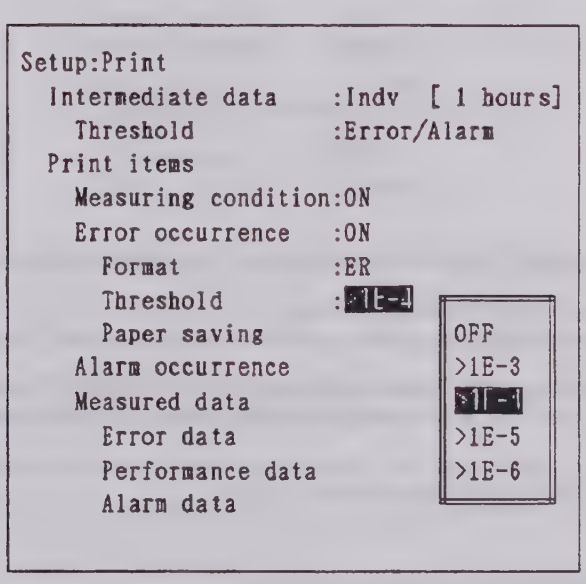


Fig. 5-74 Setting the Error Threshold Value (ER)

Note: *This item can be set when the error printing is set to ON.*

(4) Setting paper saving:

If errors occur continuously, printing can be stopped to save paper.

Setting ranges are as follows:

[Setting ranges] OFF : Does not use the paper saving function.

ON : Uses the paper saving function.

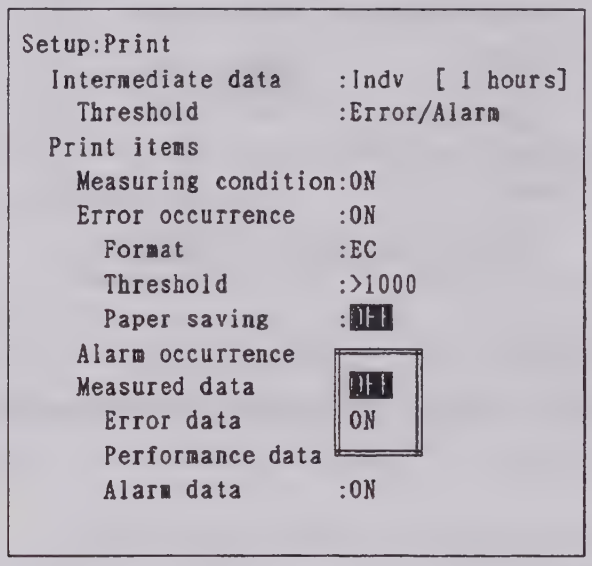


Fig. 5-75 Setting Paper Saving

Paper saving function

- If errors in excess of the threshold value in (3) continue for ten seconds, the paper saving function stops printing.

  The fact that printing has been stopped, and the time that printing stopped, are printed.

- If errors not in excess of the threshold value in (3) continue for ten seconds, the paper saving function cancels the stopped state. The fact that the stopped state has been canceled and the cancellation time are printed.

- The paper saving function then repeats the above operations.

Note: *This item can be set when error printing is set to ON.*

5.9.5 Printing an alarm

When an alarm occurs or is recovered during a measurement, a message to that effect is printed.

[Settable item] The following item can be set:

- Whether to print the alarm

(1) Setting whether to print the alarm:

Sets whether to print alarm occurrence or recovery during a measurement.

Setting ranges are as follows:

[Setting ranges] OFF : Does not print alarm occurrence or recovery.

ON : Prints alarm occurrence or recovery.

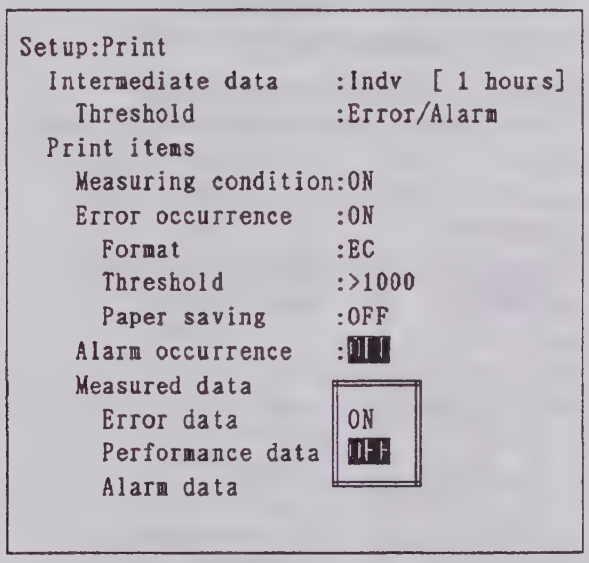


Fig. 5-76 Setting Whether to Print the Alarm

Notes:

- *If the set time comes during a measurement, the measurement being performed has priority, and the automatic measurement function does not operate.*
- *When the set time comes, the measurement starts and the setting is set to OFF.*

5.9.6 Printing the measured result data

This sets the measured result data to be printed when a measurement ends.

[Settable item] The following items are set:

- The measured result data
- The error data
- The performance data
- The alarm data
- The jitter data

(1) Setting items of the measured result data:

Sets the measured results to be printed when a measurement ends.

Setting ranges are as follows:

[Setting ranges] OFF : Does not print measured results.

ON : Prints all measured results.

Select : Selects measurd results to be printed.
These measured results are selected in (2) to (4).

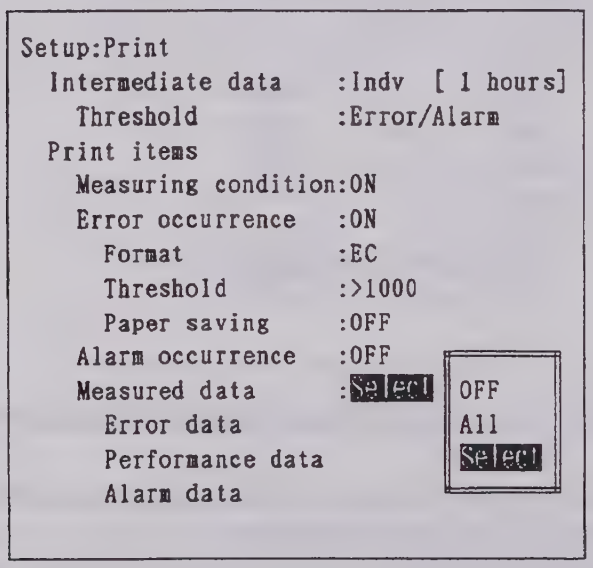


Fig. 5-77 Setting Items of the measured result Data

(2) Setting the error data:

Sets the type of error to be printed.

Setting ranges are as follows:

[Setting ranges]

OFF	:	Does not print error data.
All	:	Prints all error measured results.
Bit	:	Prints only measured results of bit errors.
Code	:	Prints only measured results of code errors.
FRM 139M	:	Prints only measured results of 139M frame errors.
FRM 34M	:	Prints only measured results of 34M frame errors.
FRM 8M	:	Prints only measured results of 8M frame errors.
FRM 2M	:	Prints only measured results of 2M frame errors.
CRC-4	:	Print only measured results of 2M CRC errors.

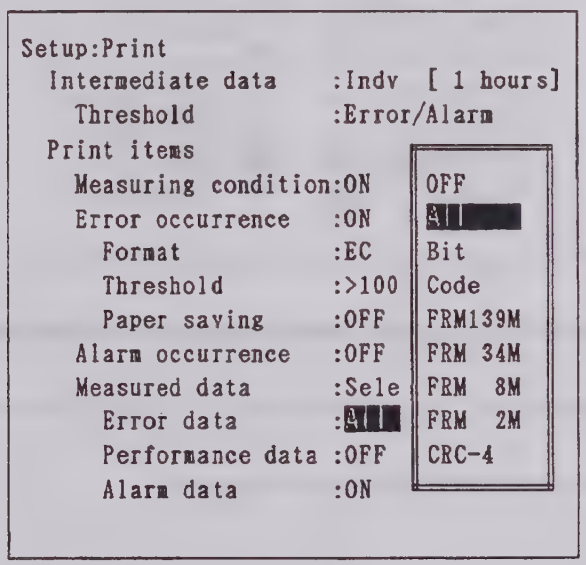


Fig. 5-78 Setting Error measured results

Notes: • *This item can be set when Select is selected for the measured result printing in (1).*

• *If an item other than All is set, and if an error that should not be measured is set because of a measuring condition setting, the measured result of the error is not printed. For example, if a receive signal is 2M, and if FRM 34M is set or Bit is set for the in-service measurement, the measured result of the error is not printed.*

(3) Setting the performance data:

Sets whether to print the performance measured result.

Setting ranges are as follows:

[Setting ranges] OFF : Does not print the performance measured result.
ON : Prints the performance measured result.

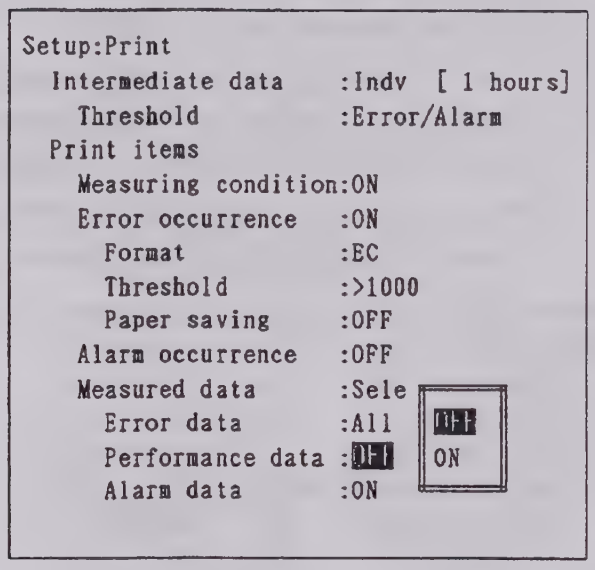


Fig. 5-79 Setting the Performance Measured Result

Notes:
- *Set the type of performance measured result on the Setup:Performance screen as explained in paragraph 5.8.*
- *If performance is not measured, this item is not printed.*

(4) Setting the alarm data:

Sets whether to print the alarm measured result.

Setting ranges are as follows:

[Setting ranges] OFF : Does not print the alarm measured result.

ON : Prints the alarm measured result.

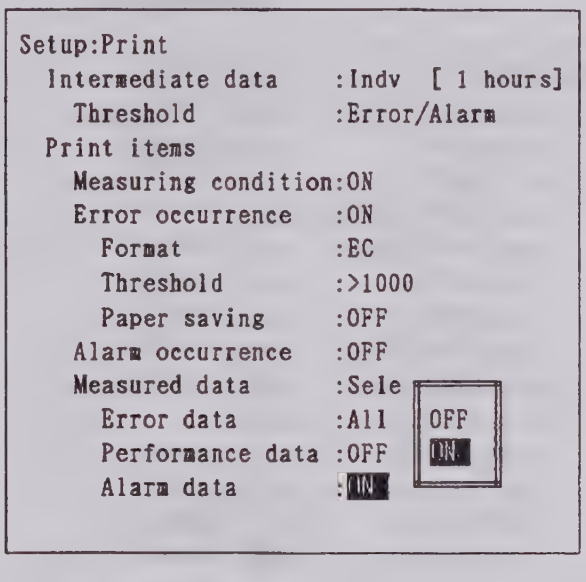


Fig. 5-80 Setting the Alarm Measured Result

(5) Setting the jitter data:

Sets whether or not jitter measurement results are printed (max. jitter amplitude and Hit measured value during error measurement period of the receiver).

Setting ranges are as follows:

[Setting ranges] OFF : Does not print the jitter measured result.

ON : Prints the jitter measured result.

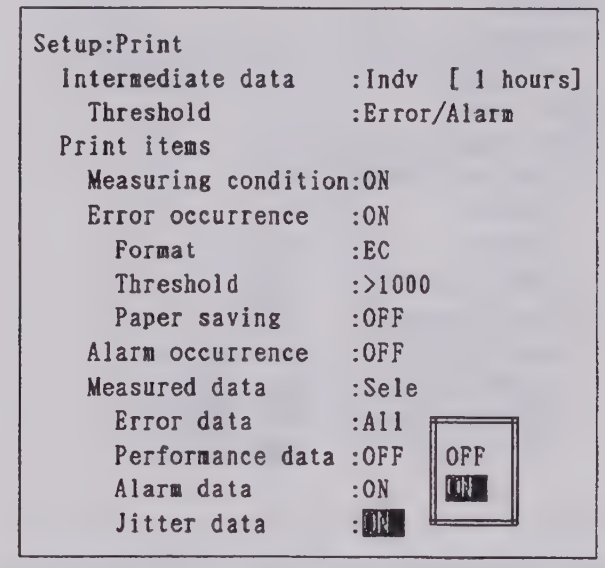


Fig. 5-121 Setting the Jitter Measured Result

Notes:
- *The Jitter data is displayed only when the jitter generation/measurement option is installed.*
- *The maximum jitter amplitude is not printed out when the measurement mode is other than Coupled.*

5.10 Settings on the Setup:Memory Screen

5.10.1 Functions

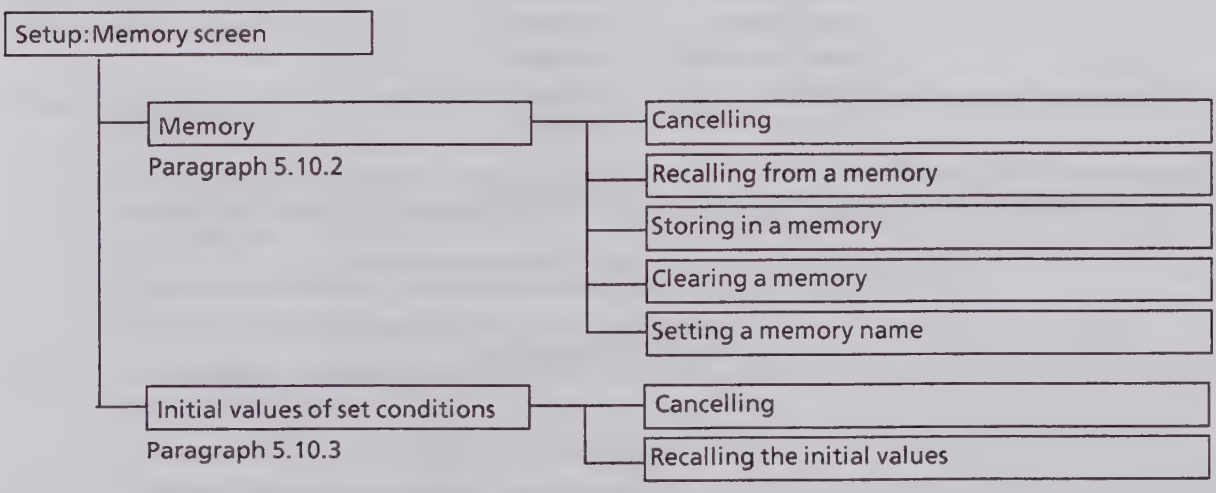
The MP1520B has 20 memories for storing setup conditions. Use this screen to set these memories.

The Setup:Memory screen and settings are as follows:

```
Setup:Memory

  1:139M TEST by Ke  11:ABCDEFGHIJKLMNO
  2: 34M TEST        12:Empty
  3:Empty            13:Empty
  4:Empty            14:Empty
  5:Empty            15:Empty
  6:Empty            16:Empty
  7:Empty            17:Empty
  8:Empty            18:Empty
  9:Empty            19:Empty
 10:Empty            20:Empty

                      0:Initial
```



Notes: • *The Memory key can be used to recall the contents of a memory or the initial values.*
• *The contents of a memory may be lost due to incorrect operation or a failure.*

5.10.2 Memory

Use this screen to set up a memory. Move the cursor over the number (name) of the memory to be specified and press the Set key.

Since it indicates that the memory is empty if Empty is displayed, data cannot be recalled from this memory, data cannot be erased, and a name cannot be set.

If Fail is displayed, the contents of the memory were lost due to a failure or other cause. Operations of this memory are the same as those of an empty memory.

[Settable items] The following items can be set:

- Cancelling (Cancel)
- Recalling from a memory (Recall)
- Storing in a memory (Store)
- Clearing a memory (Clear)
- Setting a memory name (Name)

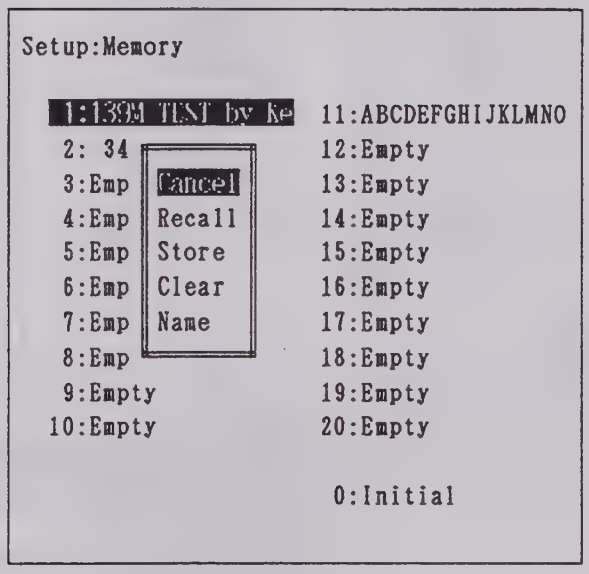


Fig. 5-81 Memory

(1) Cancelling:

Stop using a memory.

If the Set key is pressed by mistake, the operation can be halted by selecting Cancel.

(2) Recalling from a memory:

Recall the contents of a memory and change the set conditions. The already-stored set conditions are overwritten. To save the set conditions, temporarily save them in a free memory, then recall them as follows:

(1) Move the cursor over an Empty memory, then press the Set key.

(2) Select Store. To give a name to the memory, set the name as explained in the name entry procedures in paragraph 4.5.3, (3).

(3) Move the cursor over the memory containing the data to be recalled, then press the Set key.

(4) Select Recall and change the set conditions.

(3) Storing in the memory:

Save the currently set contents in the memory. The already-saved contents are overwritten.

(4) Clearing the memory:

Clear the memory to empty.

(5) Setting the memory name:

Set the memory name.

Notes: • *To prevent a memory from being operated incorrectly, do not use an improper name such as Empty or Fall.*

- *If data is stored in an empty memory, a number (name) Memory 1 to Memory 20 is automatically given to that memory. If settings are stored in a memory that is already holding settings, its name is not changed.*
- *If a memory is called during a measurement, the measurement is restarted.*
- *The following setting items are not stored in a memory:*
  - *Time settings (measurement start time, text display start time, bar graph display start time, current time, etc.)*
  - *Currently selected screen and cursor positions*
  - *Remote, panel lock, and printer enable settings*

5.10.3 Initial values of set conditions

This returns the set conditions to their initial values (the values set when the MP1520B was shipped from the factory). Move the cursor over number 0 (Initial) and press the Set key.

[Settable items] The following items can be set:

- Cancelling (Cancel)
- Recalling initial values (Recall)

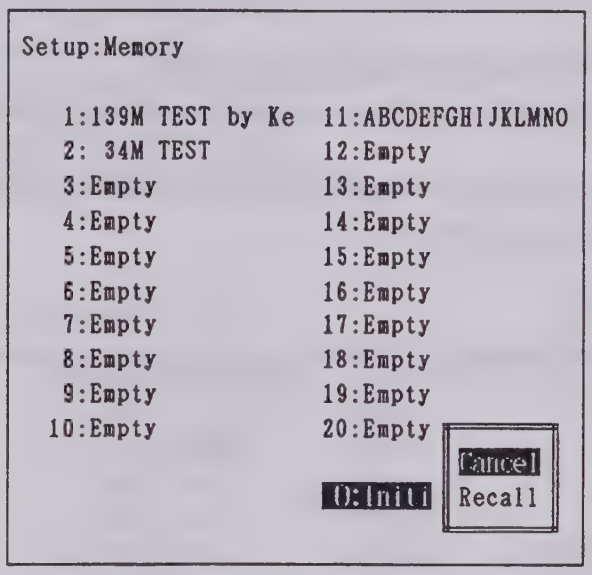


Fig. 5-82 Initial Values of Set Conditions

(1) Cancelling:

Cancels operations on initial values of set conditions. If the Set key is pressed by mistake, the operation can be halted by selecting Cancel.

(2) Recalling initial values:

Recalls initial values to change set conditions. The already-stored set conditions are overwritten. To save set conditions, temporarily save them in a free memory, then recall them.

Notes: • *If initial values are recalled during a measurement, the measurement is restarted.*

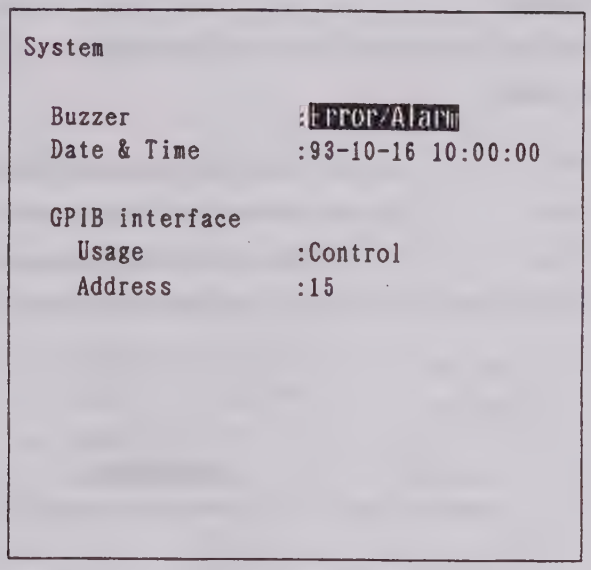
- *The following set conditions are not recalled:*
  - *Time settings (measurement start time, text display start time, bar graph display start time, current time, etc.)*
  - *Currently selected screen and cursor positions*
  - *Remote, panel lock, and printer enable settings*
- *See Appendix A for the meanings of the initial values.*

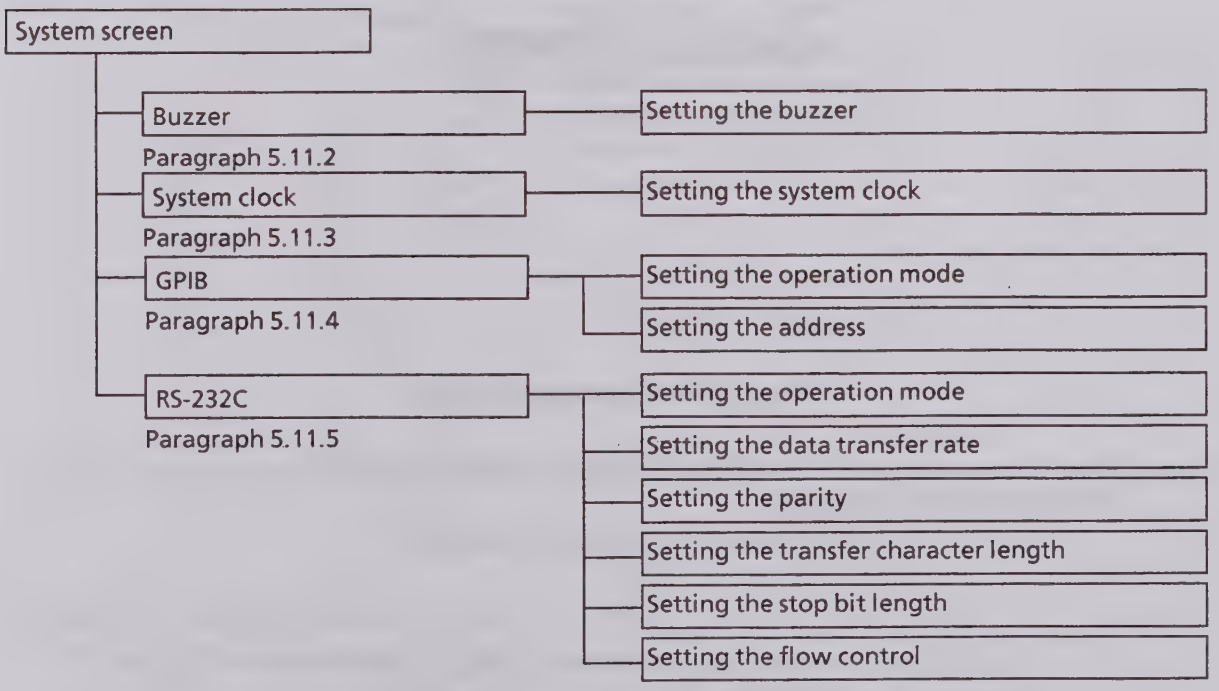
5.11 Settings on the System Screen

5.11.1 Functions

Set the system clock, buzzer, and external interface.

The System screen and settings are as follows:





Note: *When the GPIB or RS-232C setting is displayed, the board that is mounted is automatically identified.*

If no board is mounted, the setting is not displayed.

5.11.2 Buzzer

This sets the buzzer.

[Settable items] The following item can be set:

- The buzzer

(1) Setting the buzzer:

Sets whether to operate the buzzer when an error or alarm occurs.

Setting ranges are as follows:

[Setting ranges]

OFF	:	Does not sound the buzzer even if an error or alarm occurs.
Error	:	If an error occurs, the buzzer sounds.
Alarm	:	If an alarm occurs, the buzzer sounds.
Error/Alarm	:	If an error or alarm occurs, the buzzer sounds.

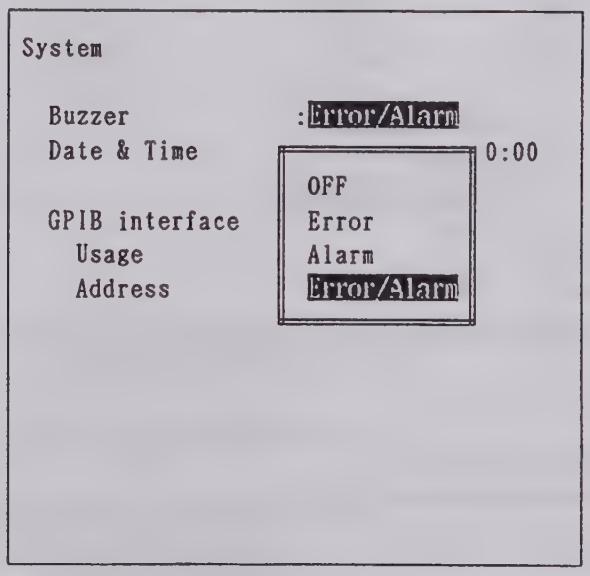


Fig. 5-83 Setting the Buzzer

Note: *Even if a measurement is suspended, the buzzer operates when an alarm or error occurs in accordance with the above setting.*

5.11.3 System clock

This sets the system clock.

[Settable items] The following item can be set:

- The system clock

(1) Setting the system clock:

Sets the clock built in the MP1520B.

Setting ranges are as follows:

[Setting ranges] Year-Month-Day hour:min:sec

Year	:	An integer from 00 to 99
Month	:	An integer from 01 to 12
Day	:	An integer from 00 to 31
hour	:	An integer from 00 to 23
min	:	An integer from 00 to 59
sec	:	An integer from 00 to 59

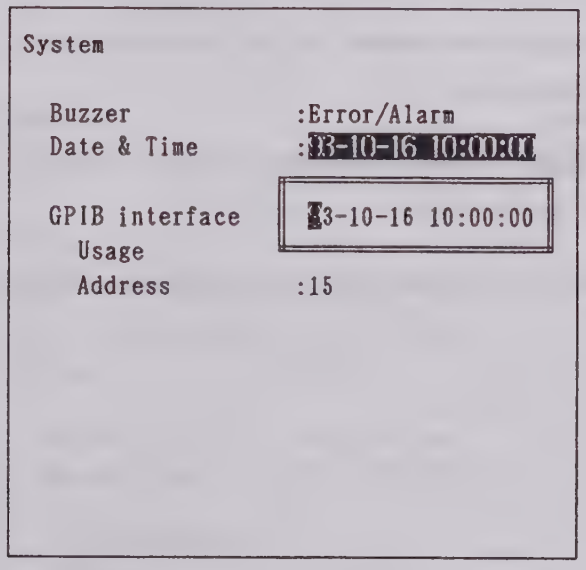


Fig. 5-84 Setting the System Clock

Notes: • *A nonexistent date cannot be set.*

- *Set the two lower digits of a year. A specification of 00 means the year 2000.*
- *If the setting is changed during a measurement, the measurement is restarted.*

5.11.4 GPIB

If the GPIB board is mounted, the following screen is displayed, and GPIB can be set.

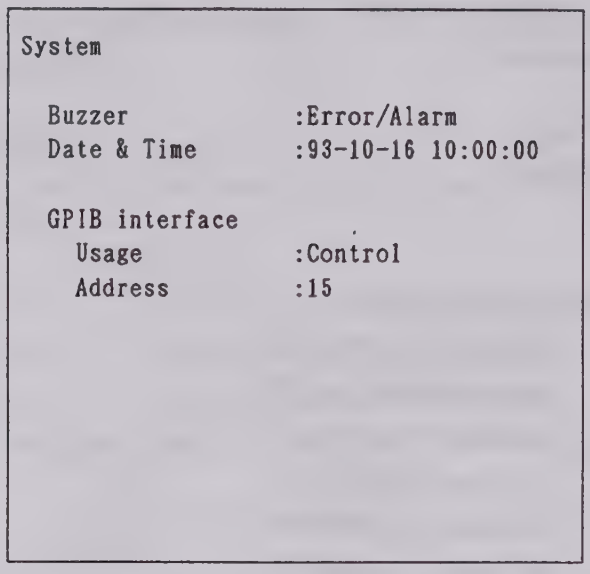


Fig. 5-85 System Screen when GPIB Board Mounted

[Settable items] The following items can be set:

- The operation mode
- The address

[Related item] The following item affects this setting:

- External interface board

Note: *This item can be set when the GPIB board (option) is mounted.*

(1) Setting the operation mode:

Sets the operation mode of the GPIB interface.

Setting ranges are as follows:

[Setting ranges] Control : Controls the MP1520B from an external controller.
Printer : Controls an external printer.

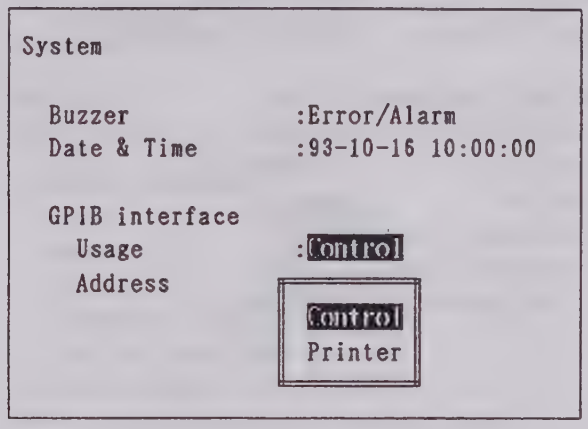


Fig. 5-86 Setting the Operation Mode

Note: *When an external printer is controlled, talk only mode is set.*

(2) Setting the address:

When using GPIB to control the MP1520B from an external controller, set the GPIB address of the MP1520B.

The setting range is as follows:

[Setting ranges] An integer from 0 to 30

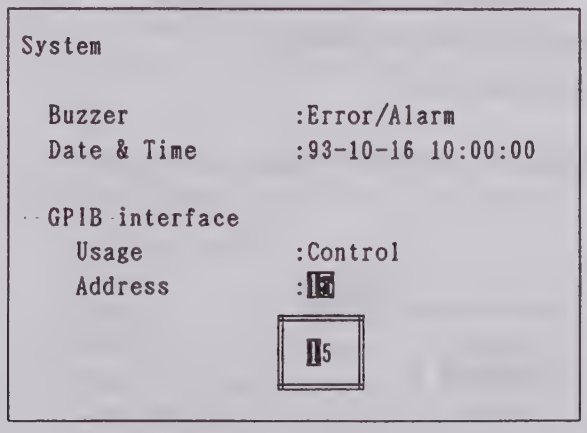


Fig. 5-87 Setting the Address

Note: *This item can be set when the MP1520B is controlled from an external controller.*

5.11.5 RS-232C

If the RS-232C board is mounted, the following screen is displayed, and RS-232C can be set.

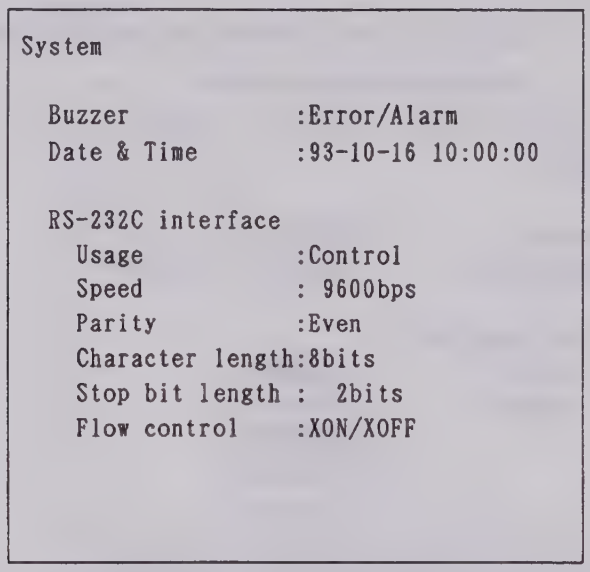


Fig. 5-88 System Screen when RS-232C Board Mounted

[Settable items] The following items can be set:

- The operation mode
- The data transfer rate
- The parity
- The transfer character length
- The stop bit length
- The flow control

[Related item] The following item affects this setting:

- External interface board

Note: *This item can be set when the RS-232C board (option) is mounted.*

(1) Setting the operation mode:

Sets the operation mode of the RS-232C interface.

Setting ranges are as follows:

[Setting ranges] Control : Control: Controls the MP1520B from an external controller.
Printer : Controls an external printer.

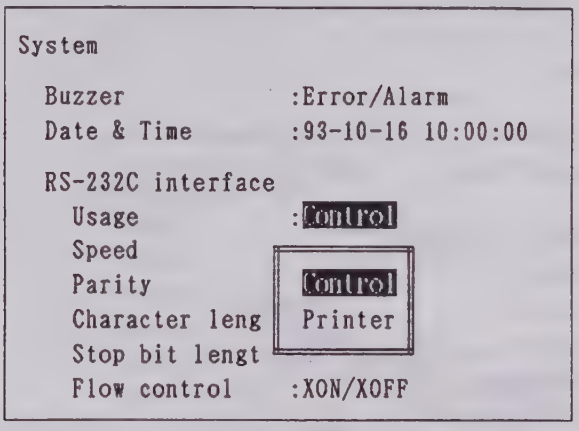


Fig. 5-89 Setting the Operation Mode

(2) Data transfer rate:

Sets the data transfer rate.

Setting ranges are as follows:

[Setting ranges] 19200 bps : Sets the data transfer rate to 19200 bps.
9600 bps : Sets the data transfer rate to 9600 bps.
4800 bps : Sets the data transfer rate to 4800 bps.
2400 bps : Sets the data transfer rate to 2400 bps.
1200 bps : Sets the data transfer rate to 1200 bps.
600 bps : Sets the data transfer rate to 600 bps.
300 bps : Sets the data transfer rate to 300 bps.

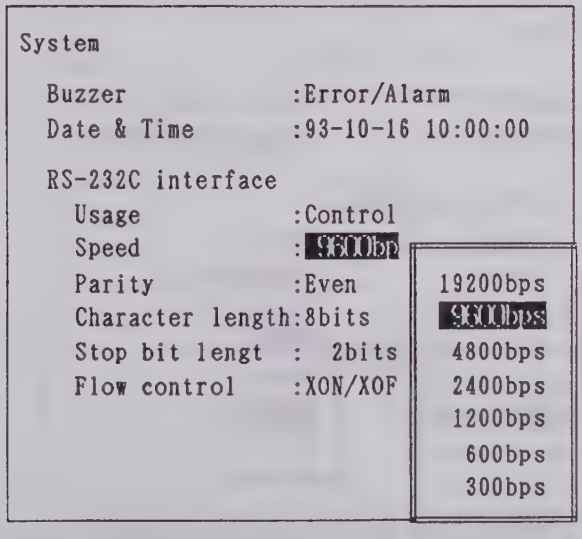


Fig. 5-90 Setting the Transfer Rate

(3) Setting the parity:

Sets the parity type.

Setting ranges are as follows:

[Setting ranges] None : No parity.
Even : Even parity.
Odd : Odd parity.

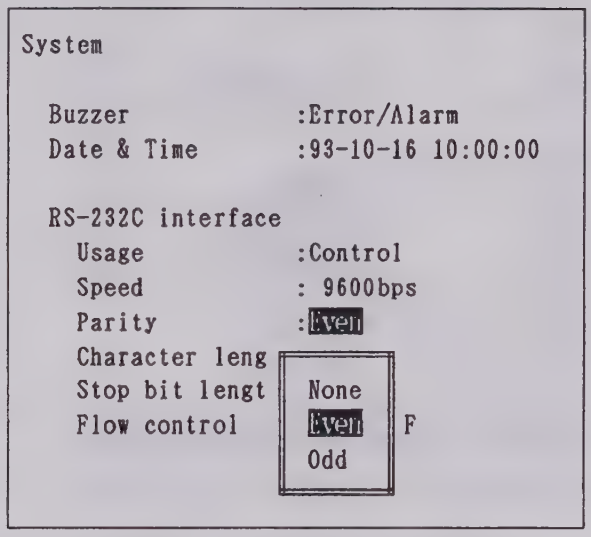


Fig. 5-91 Setting the Parity

(4) Setting the transfer character length:

Sets the transfer character length (in bits).

Setting ranges are as follows:

[Setting ranges] 8 bits : Sets the character length to eight bits.
7 bits : Sets the character length to seven bits.

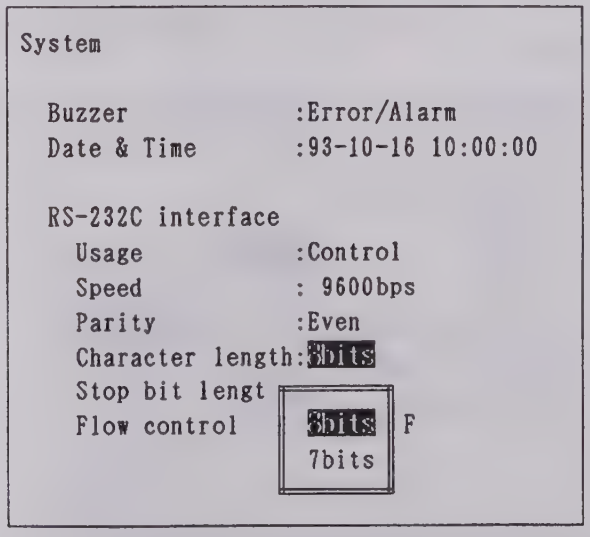


Fig. 5-92 Setting the Transfer Character Length

(5) Setting the stop bit length:

Sets the stop bit length.

Setting ranges are as follows:

[Setting ranges]
- 2 bits : Sets the stop bit length to two bits.
- 1.5 bits : Sets the stop bit length to 1.5 bit.
- 1 bit : Sets the stop bit length to one bit.

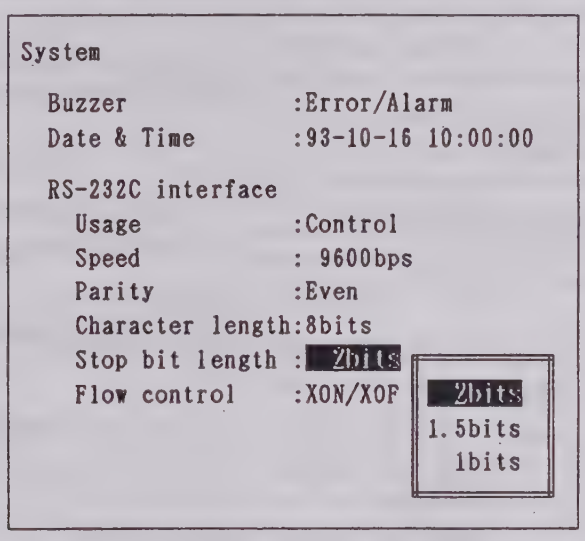


Fig. 5-93 Setting the Stop Bit Length

(6) Setting the flow length:

Sets the flow control method.

Setting ranges are as follows:

[Setting ranges]
- Ready/Busy : Uses the RS-232C control line.
- XON/XOFF : Uses the XON/XOFF character for flow control in addition to the control line.

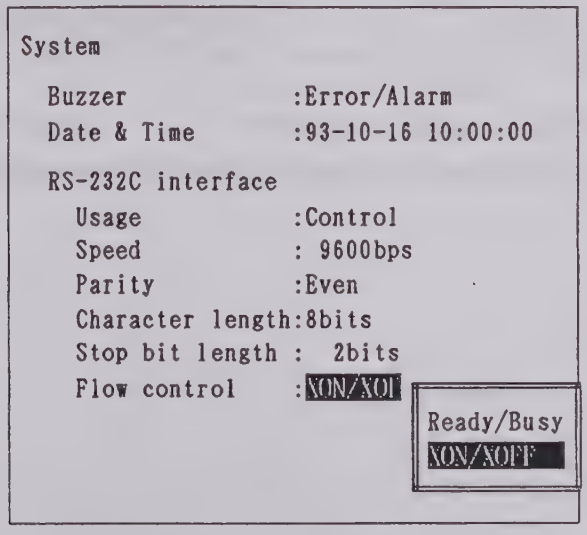


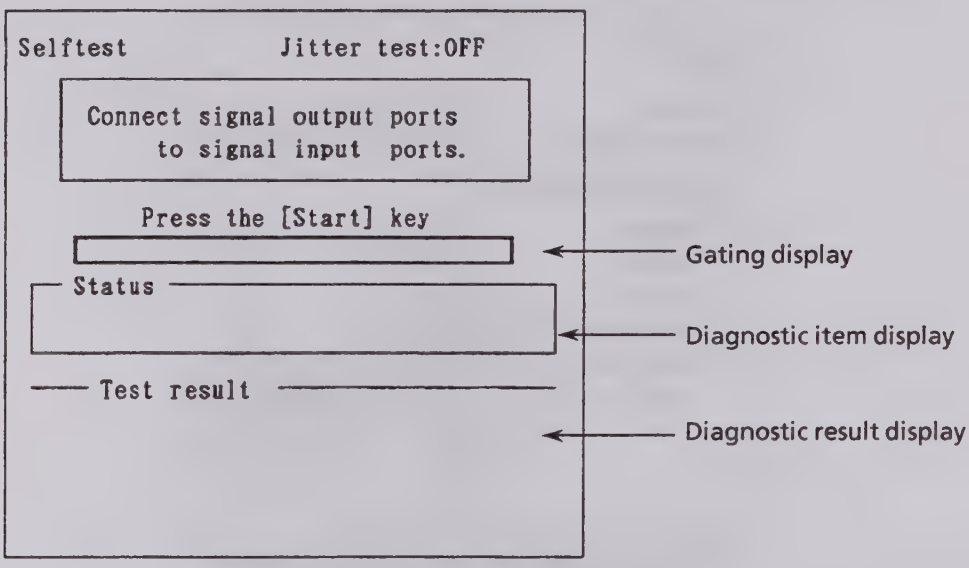
Fig. 5-94 Setting the Flow Control

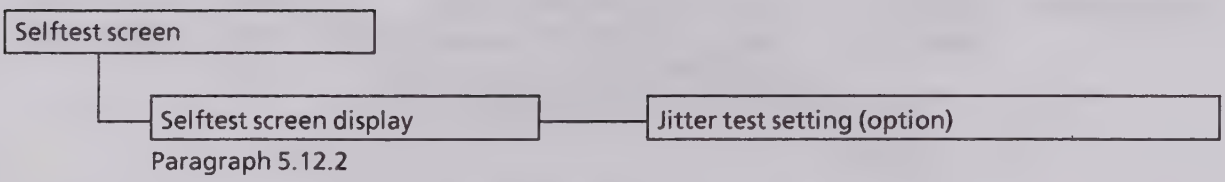
5.12 Setting the Selftest Screen

5.12.1 Functions

This displays the progress of the self-diagnostic test, and its result.

The Selftest screen and settings are as follows:





Paragraph 5.12.2

Notes: • *See paragraph 3.2, (3) for connection at the selftest.*

• *The "Jitter test" on the first line is displayed only when the jitter generation/measurement option is installed.*

5.12.2 Displaying the Selftest Screen

Select if selftest results are indicated and the jitter selftest is conducted or not.

[Settable items] The following item can be set:

- With/without jitter test (option)

[Displayed items] The following items are displayed on the Selftest screen:

- Gating display
- Diagnostic item display
- Diagnostic result display

(1) With/without jitter test:

Select if the jitter selftest is conducted or not.

Setting ranges are as follows:

[Setting ranges] OFF : Jitter selftest is not conducted.

ON : Jitter selftest is conducted.

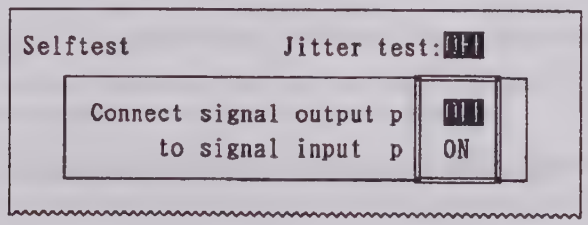


Fig. 5-122 Setting of With/without Jitter Test

(2) Gating display:

A gating for each self-diagnostic item is displayed.

An already diagnosed part is displayed in ■ and a part to be diagnosed is displayed in =.

(3) Diagnostic item display:

An item being diagnosed is displayed.

(4) Diagnostic result display:

When self-diagnosis terminates normally, "Passed" is displayed. If a self-diagnosis error occurs, a code indicating the error type is displayed.

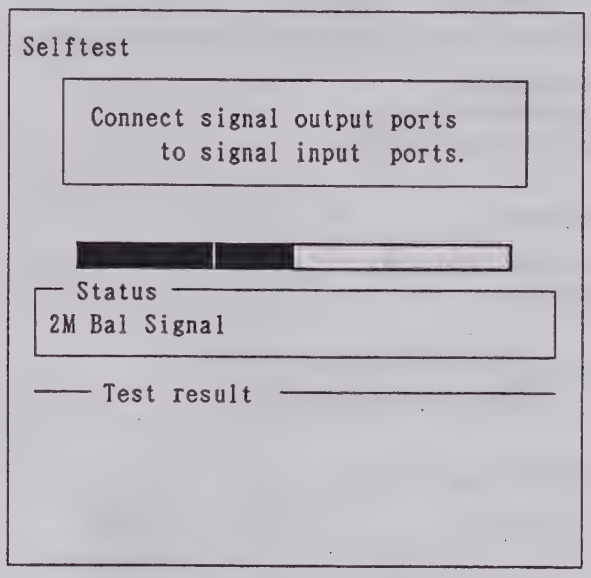


Fig. 5-95 Display during Self-Diagnosis

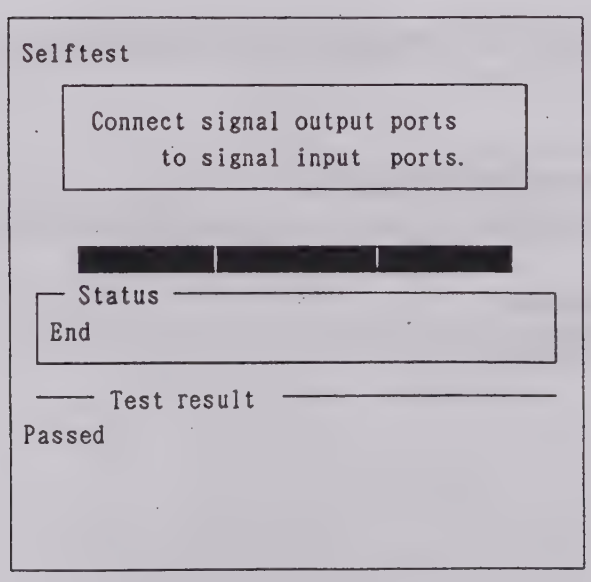


Fig. 5-96 Display when Selftest Ends (Normal End)

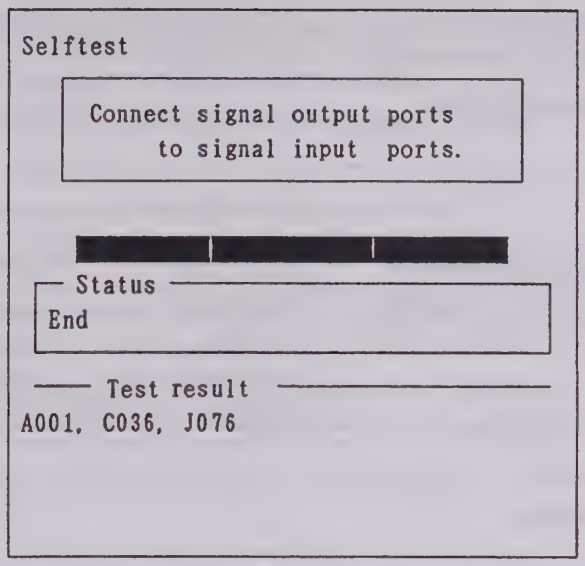


Fig. 5-97 Display when Selftest Ends (Abnormal End)

Notes: • *If cables are connected incorrectly, a selftest error occurs.*

• *See Appendix B for explanations on codes output when selftest errors occur.*

• *No jitter tests are conducted only when the jitter generation/measurement option is installed.*

5.13 LED Displays

Alarm and error LEDs at the bottom of the LCD screen on the front panel of this instrument indicate alarm and error states during a measurement.

The alarm and error LEDs are as follows:

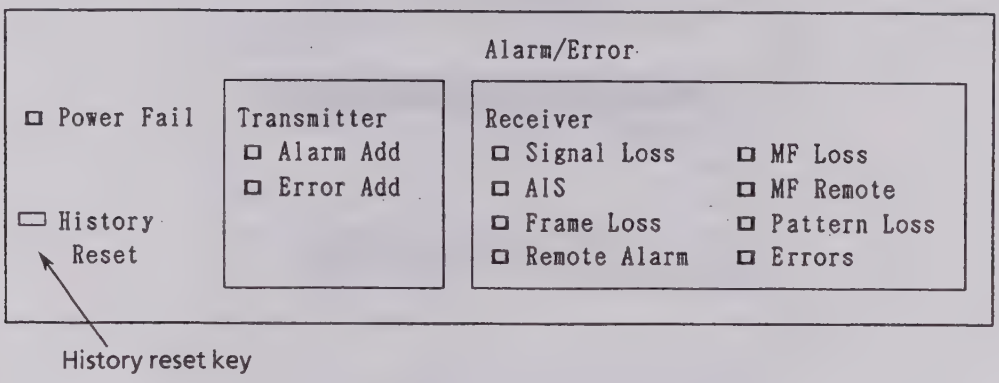


Fig. 5-98 Alarm and Error LEDs

The LEDs light under the following conditions:

LED name		Color	Lighting condition
Power Fail		Orange	Lights when the power supply is turned off during a measurement. (This LED does not light while the power supply is off.)
Transmitter	Alarm add	Green	Lights when an alarm is added in the transmitter section.
	Error Add	Green	Lights when an error is added in the transmitter section.
Receiver	Signal Loss	Red	Lights when a signal is turned off in the receiver section.
	AIS	Red	Lights when AIS occurs in the receiver section. (*1)
	Frame Loss	Red	Lights when a frame loss occurs in the receiver section. (*1)
	Remote Alarm	Red	Lights when a remote alarm occurs in the receiver section. (*1)
	MF Loss	Red	Lights when a multiframe loss occurs in the receiver section. (*1)
	MF Remote	Red	Lights when a multiframe remote alarm occurs in the receiver section. (*1)
	Pattern Loss	Red	Lights when a pattern sync loss occurs in the receiver section.
	Errors	Red	Lights when an error occurs in the receiver section. (*1)

*1 If DEMUX (option) is set to ON, this LED lights when one or more alarms or errors occur in any signal being measured.

The LEDs that light in red have a history function (they remain lit even if the error or alarm is recovered). These LEDs light in orange (history lighting) while the history function is operating. If an alarm or error occurs during the history lighting, the LED lights in red until the alarm or error is recovered. The Power Fail alarm performs only the history lighting.

The History Reset key can be used to turn the LED off during history lighting.

Notes:
- *The History Reset key only turns off a history lighting LED.*
- *The history lighting period is set at the same time as the measured result display (Current/Last setting) on the Result screen. If Current is set, history lighting continues from the occurrence of an alarm or error to when the next measurement starts. If Last is set, history lighting continues from the start to the end of the next measurement.*
- *Even in a measurement stop state, an LED lights when an alarm or error occurs. However, the history lighting function is invalid for an alarm or error in a measurement stop state.*

5.14 Printing

There are two printing methods; screen printing using the Copy key and automatic printing according to settings on the System:Print screen. Screen printing has priority over automatic printing. If the Copy key is pressed during automatic printing, the automatic printing is halted, then restarted after the contents displayed on the screen have been printed.

Notes: • *If errors or alarms occur frequently or a repeat measurement is performed within a short time (e.g., one second), a large amount of data must be printed. In this case, data may be lost because the printer is too slow.*

• *Print data with the internal printer while the LED on the Print key is on. To print data with an external printer, set the operation mode of the external interface (Usage) to Printer to switch the printer on.*

5.14.1 Printing the screen

When the Copy key is pressed, the contents displayed on the screen are printed.

The following figures are printing format examples.

- **Condtn/Result screen**

```
 1        10        20      28
+---------+---------+-------+
|Condtn    :             Tx&Rx|
| Bit rate:   139Mb/s +100ppm|
| MUX                  64kx05|
|    [34M#1<8M#2<2M#3<64k#12]|
| Patt     :           Word16|
|       [1111 0000 1010 0101]|
| Frame    :               ON|
| Alarm    :          AIS139M|
| Error    :        Code Sgl |
| Mode     : Repeat [99 hours]|
| Jitt     :               ON|
|**********==================|
|Result    :        Error-Bit|
| Dspl     :          Current|
| Time     :          Elapsed|
|          [      98 23:59:48]|
|  EC                    20  |
|  ER                1.08E-05|
|  ES                   321  |
|  Freq              - 12.5ppm|
| G.821 Performance           |
|  %ES               32.0156% |
|  %SES               0.0000% |
|  %DM              100.0000% |
|  %US                1.1028% |
+---------+---------+--------+
```

Printing format of the internal printer

```
 1        10        20        30        40
+---------+---------+---------+---------+
|Condtn:Tx&Rx    Bit rate:139Mb/s +100ppm|
| MUX  :64kx05   [34M#1<8M#2<2M#3<64k#12]|
| Patt :Word16       [1111 0000 1010 0101]|
| Frame:ON                               |
| Alarm:AIS139M      Error:Code    Sgl   |
| Mode :Repeat[99 hours]   Jitt:ON       |
|**************============================|
|Result:Error -Bit       Dspl:Current    |
| Time :Elapsed        [      98 23:59:48]|
| EC             20    |G.821 Performance |
| ER       1.08E-05    | %ES      32.0156% |
| ES            321    | %SES      0.0000% |
|                       | %DM     100.0000% |
| Freq       - 12.5ppm| %US       1.1028% |
|                       |                   |
+---------+---------+---------+-----------+
```

Printing format of the external printer

Fig. 5-99 Printing Format of the Condtn/Result Screen

• Analysis:Trace Text screen

```
+1--------10--------20------28+
|Analysis     :    Trace Text|
| Error Format:            EC|
| From        :10-21 12:00:00|
| Print       :          Dspl|
| -------------------------- |
| 10-21 12:05:02             |
|   Bit Err       1.45E+08   |
|   Code Err      9.21E+12   |
|   FRM 34M Err   2.82E+09   |
|   AIS139M       occur      |
|   AIS 34M       recover    |
|   RA   MF       occur      |
| 10-22 10:08:53             |
|   Code Err           225   |
| ***************************|
| * 94-02-12 11:00:00 Stop  *|
| * (Interval:    99 hours) *|
| ***************************|
| Measured data              |
+---------+---------+--------+
```

Printing format of the internal printer

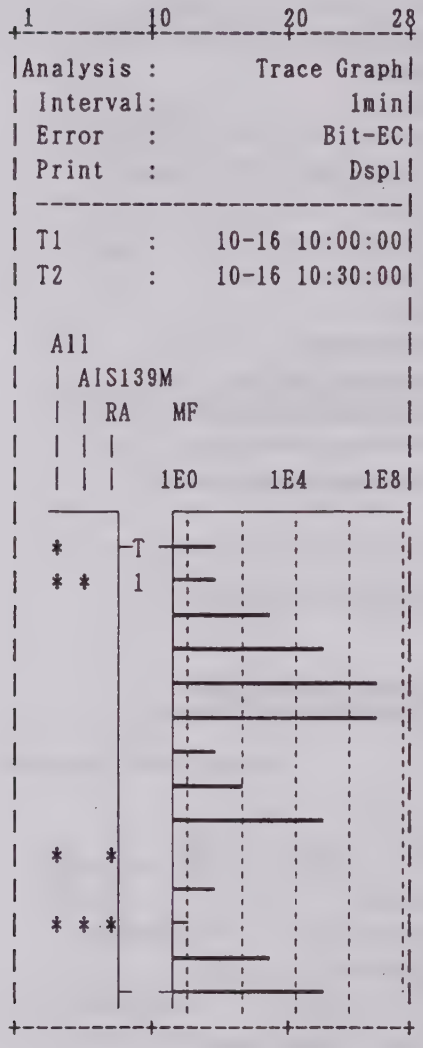
```
+1--------10--------20--------30--------40+
|Analysis:Trace Text   Error Format:EC    |
| From:10-21 12:00:00  Print:After        |
|-----------------------------------------|
|10-21 12:05:02  Bit Err      1.45E+13    |
|                Code Err     9.21E+12    |
|                FRM 34M Err  2.87E+09.    |
|                AIS139M      occur       |
|                AIS 34M      recover     |
|                RA   MF      occur       |
|10-22 10:08:53  Code Err          225    |
|*****************************************|
|***  92-10-22 11:00:00  Stop       ***   |
|***  (Interval:    99 hours)       ***   |
|*****************************************|
|Measured data                            |
+---------+---------+---------+---------+
```

Printing format of the external printer

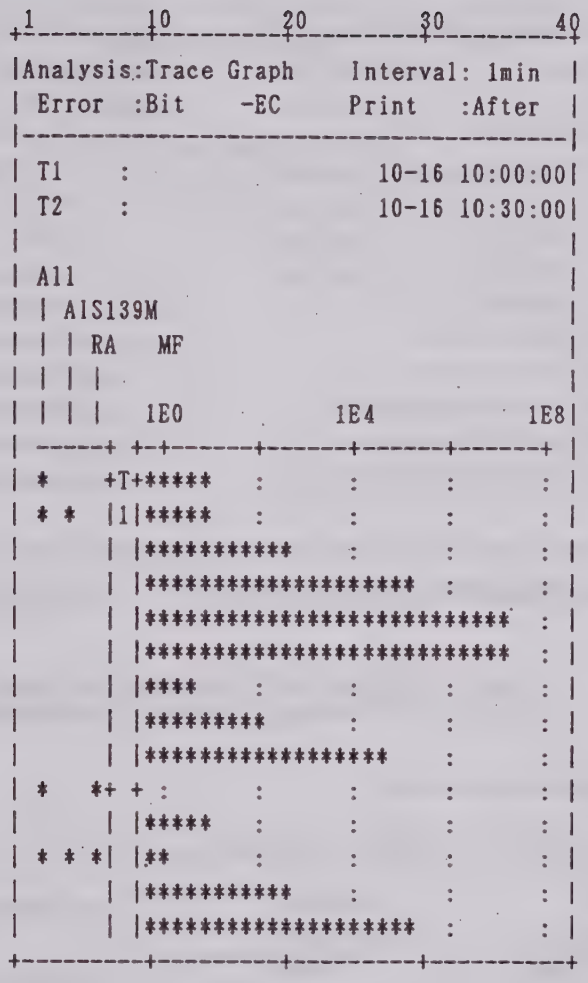
Fig. 5-100 Printing Format of the Analysis:Trace Text Screen

Note: *The printing range differs depending on the value set for the text printing range as explained in paragraph 5.4.5.*

• Analysis:Trace Graph screen



Printing format of the internal printer

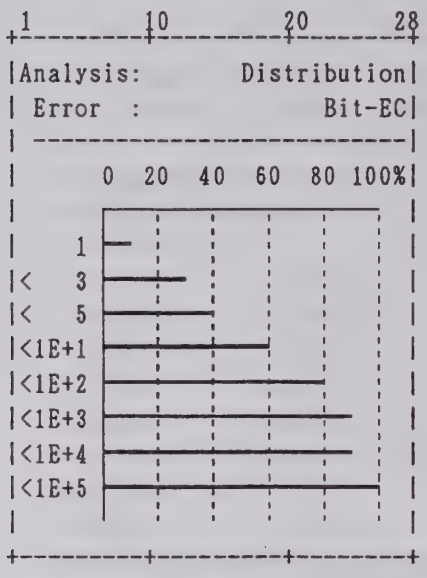


Printing format of the external printer

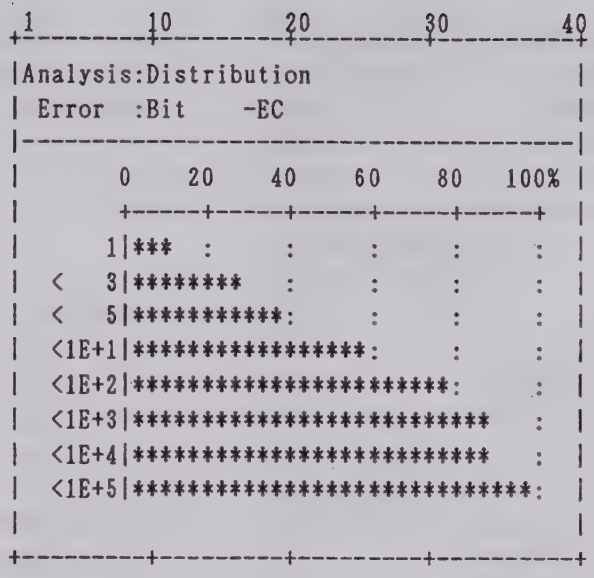
Fig. 5-101 Printing Format of the Analysis:Trace Graph Screen

Note: *The printing range differs depending on the value set for the text printing range as explained in paragraph 5.4.5.*

• Analysis:Distribution screen



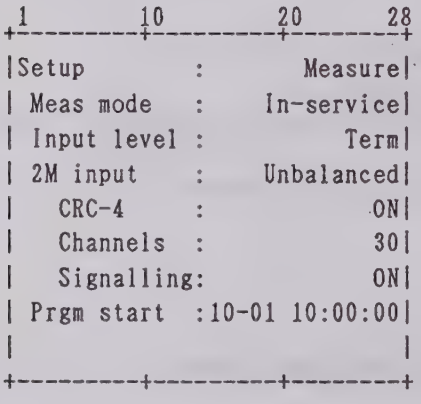
Printing format of the internal printer



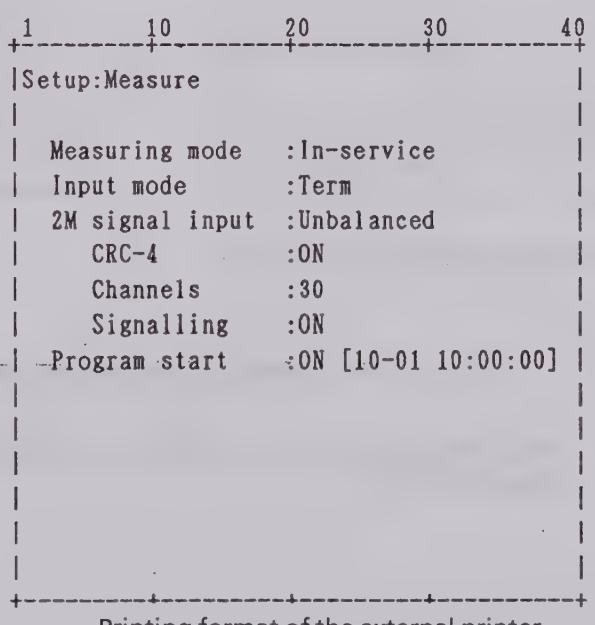
Printing format of the external printer

Fig. 5-102 Printing Format of the Analysis:Distribution Screen

• Setup:Measure screen



Printing format of the internal printer



Printing format of the external printer

Fig. 5-103 Printing Format of the Setup:Measure Screen

● **Setup:Performance screen**

```
+1--------10--------20------28+
|Setup         :   Performance|
| Type         :         G.821|
| Frame(DEMUX):          139M|
| Threshold                   |
|   %ES        :    [12.3456%]|
|   %SES       :           OFF|
|   %DM        :    [ 3.1111%]|
|   %US        :           OFF|
|                             |
+---------+---------+--------+
```

Printing format of the internal printer

```
+1--------10--------20--------30--------40+
|Setup:Performance                        |
|                                         |
|  Type           :G.821                  |
|  Frame(DEMUX)   :139M                   |
|  Threshold %ES  :ON  [12.3456%]         |
|            %SES :OFF                    |
|            %DM  :ON  [ 3.1111%]         |
|            %US  :OFF                    |
|                                         |
|                                         |
|                                         |
|                                         |
|                                         |
|                                         |
|                                         |
|                                         |
+---------+---------+---------+---------+
```

Printing format of the external printer

Fig. 5-104 Printing Format of the Setup:Performance Screen

● **Setup:Print screen**

```
+1--------10--------20------28+
|Setup           :      Print|
| Intermediate   : Individual|
|                  [12hours]|
|  Threshold     : Error/Alarm|
| Print Items                 |
|  Meas Condtn   :         ON|
|  Error Occur   :         ON|
|   Format       :         EC|
|   Threshold    :      >1000|
|   Paper Saving :        OFF|
|  Alarm Occur   :         ON|
|  Measured Data :     Select|
|   Error        :        All|
|   Performance  :        OFF|
|   Alarm        :         ON|
+---------+---------+--------+
```

Printing format of the internal printer

```
+1--------10--------20--------30--------40+
|Setup:Print                              |
|                                         |
|  Intermediate Data    :Indv  [12 hours] |
|    Threshold          :Error/Alarm      |
|  Print Items                            |
|    Measuring Condition:ON               |
|    Error Occurrence   :ON               |
|      Format           :EC               |
|      Threshold        :>1000            |
|      Paper Saving     :OFF              |
|    Alarm Occurrence   :ON               |
|    Measured Data      :Select           |
|      Error Data       :All              |
|      Performance Data :OFF              |
|      Alarm Data       :ON               |
+---------+---------+---------+---------+
```

Printing format of the external printer

Fig. 5-105 Printing Format of the Setup:Print Screen

● Setup:Memory screen

```
 1        10        20      28
+---------+---------+-------+
|Setup:                Memory|
|     1: 139M TEST by Ke     |
|     2:  34M TEST by G1     |
|     3: Empty               |
|     4: Empty               |
|     5: Empty               |
|                            |
|       (The part of the way is ommitted.)
|                            |
|    19: Empty               |
|    20: Empty               |
|     0: Initial             |
+---------+---------+-------+
```

Printing format of the internal printer

```
 1        10        20        30        40
+---------+---------+---------+---------+
|Setup:Memory                           |
|                                       |
|   1:139M TEST by Ke  11:ABCDEFGHIJKLMNO|
|   2: 34M TEST by G1  12:Empty         |
|   3:Empty            13:Empty         |
|   4:Empty            14:Empty         |
|   5:Empty            15:Empty         |
|   6:Empty            16:Empty         |
|   7:Empty            17:Empty         |
|   8:Empty            18:Empty         |
|   9:Empty            19:Empty         |
|  10:Empty            20:Empty         |
|                                       |
|                       0:Initial       |
|                                       |
+---------+---------+---------+---------+
```

Printing format of the external printer

Fig. 5-106 Printing Format of the Setup:Memory Screen

● System screen

```
 1        10        20      28
+---------+---------+-------+
|System                      |
| Buzzer       :  Error/Alarm|
| Data         :     94-02-14|
| Time         :     12:00:00|
| GPIB interface             |
|  Usage       :      Printer|
|  Address     :           12|
+---------+---------+-------+
```

Printing format of the internal printer

```
 1        10        20        30        40
+---------+---------+---------+---------+
|System                                 |
|                                       |
|  Buzzer            :Error/Alarm       |
|  Data & Time       :94-02-14 12:00:00 |
|                                       |
|  GPIB interface                       |
|    Usage           :Printer           |
|    Address         :12                |
|                                       |
|                                       |
|                                       |
|                                       |
|                                       |
|                                       |
|                                       |
+---------+---------+---------+---------+
```

Printing format of the external printer

Fig. 5-107 Printing Format of the System Screen

● Selftest screen

```
1         10        20       28
+---------+---------+--------+
|Selftest   94-02-14 12:00:10|
| Jitter test:             ON|
| Result                Passed|
+---------+---------+--------+
```

Printing format of the internal printer
(at normal end of selftest)

```
1         10        20        30        40
+---------+---------+---------+---------+
|Selftest                94-02-14 12:00:10|
| Jitter test:                        ON|
| Result                           Passed|
+---------+---------+---------+---------+
```

Printing format of the external printer
(at normal end of selftest)

```
1         10        20       28
+---------+---------+--------+
|Selftest   94-02-14 12:00:10|
| Jitter test:             ON|
| Result                Failed|
|  A001, C036, J076           |
+---------+---------+--------+
```

Printing format of the internal printer
(at abnormal end of selftest)

```
1         10        20        30        40
+---------+---------+---------+---------+
|Selftest                94-02-14 12:00:10|
| Jitter test:                        ON|
| Result                           Failed|
|   A001, C036, J076                    |
+---------+---------+---------+---------+
```

Printing format of the external printer
(at abnormal end of selftest)

Fig. 5-108 Printing Format of the Selftest Screen

● Jitter:Manual screen

```
1         10        20       28
+---------+---------+--------+
|Jitter:Manual               |
| Tx (139Mb/s)               |
|  Mode     :          Internal|
|  Range    :             20UI|
|  Freq     :           500.0Hz|
|  Amptd    :           Coarse|
| Rx ( 34Mb/s)               |
|  Meas mode:          Intvl  1s|
|  Range    :             20UI|
|  Filter   :           HP1+LP|
|  Threshold:        10.0UIo-p|
|**********==================|
|Result                      |
| Dspl    :            Current|
| Time    :            Elapsed|
|         [      12 23:59:48]|
| Tx amptd          10.00UIp-p|
| Rx amptd          10.02UIp-p|
|    +Peak           5.00UI+p |
|    -Peak           5.02UI-p |
| Hit count        2.34E+07   |
| Hit seconds         12345   |
| %Hit FS           99.9999%  |
| Status             UNLOCK   |
+---------+---------+--------+
```

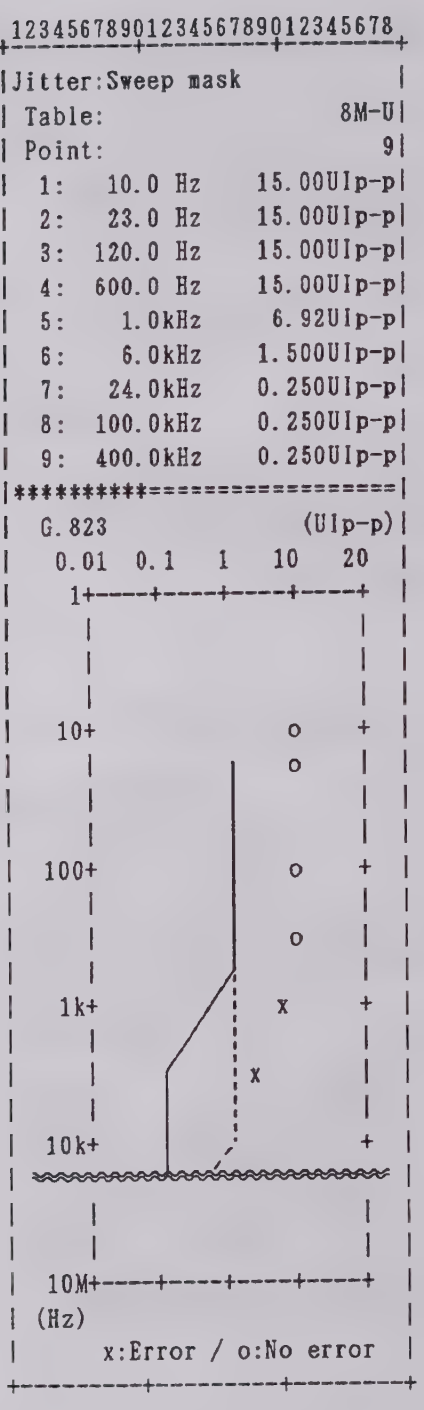
Printing format of the internal printer

```
1         10        20        30        40
+---------+---------+---------+---------+
|Jitter:Manual                          |
|    Tx(139Mb/s)      |    Rx(139Mb/s)  |
| Mode :Internal      |Meas mode:Intvl  1s|
| Range:20UI          |Range    :20UI     |
| Freq :500.0Hz       |Filter   :HP1+LP   |
| Amptd:Coarse U/D    |Threshold:10.0UIo-p|
|*************========================|
|Result                  Dspl:Current   |
| Time :Elapsed           [      12 23:59:48]|
| Jitter amplitude    |Hit                |
|  Tx      10.00UIp-p| Count     1.23E+07 |
|  Rx      10.12UIp-p| Seconds      12345 |
|   +Peak   5.05UI+p | %FS        23.4567%|
|   -peak   5.07UI-p |                   |
|                     |Status      UNLOCK |
+---------+---------+---------+---------+
```

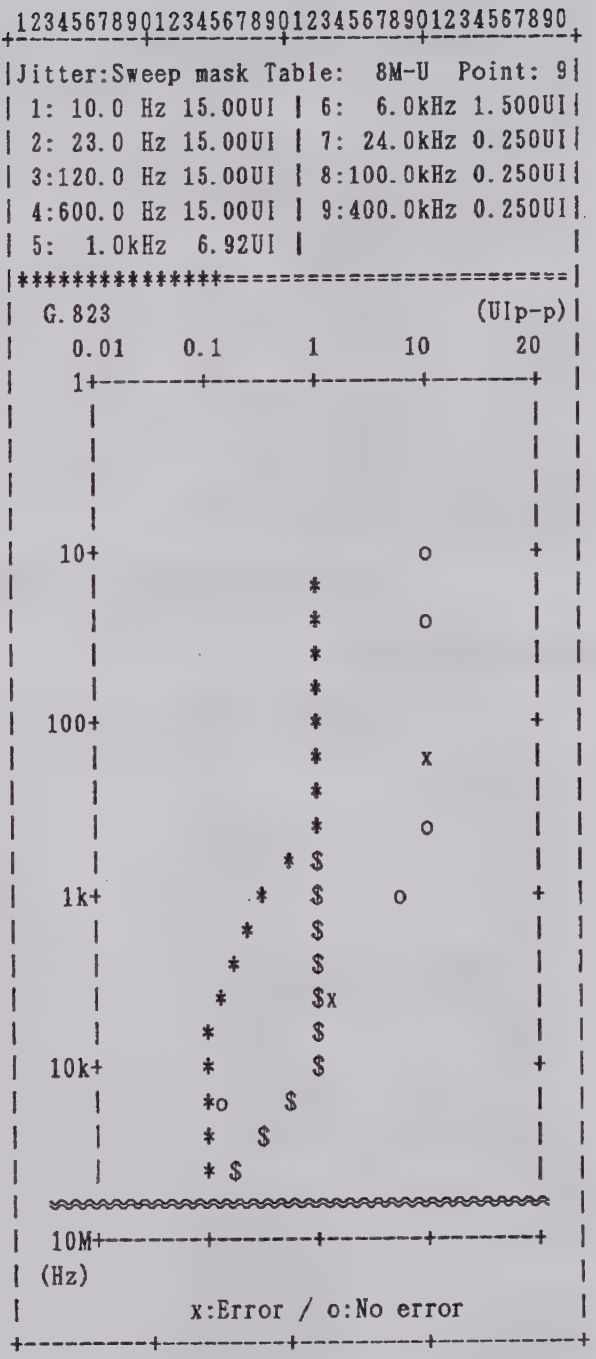
Printing format of the external printer

Fig. 5-123 Printing Format of the Jitter:Manual Screen

● Jitter:Sweep mask screen



Printing format of the internal printer



Printing format of the external printer

Fig. 5-124 Printing Format of the Jitter:Sweep mask Screen

• Jitter:Transfer screen

```
1234567890123456789012345678
+--------+--------+--------+
|Jitter:Transfer            |
| Table:              34M-U|
| Point:                10|
|  1:   10.0 Hz    15.00UIp-p|
|  2:   23.0 Hz    15.00UIp-p|
|  3:  120.0 Hz    15.00UIp-p|
|  4:  600.0 Hz    15.00UIp-p|
|  5:    1.0kHz     6.92UIp-p|
|  6:    6.0kHz    1.500UIp-p|
|  7:   10.0kHz    0.150UIp-p|
|  8:   24.0kHz    0.150UIp-p|
|  9:  100.0kHz    0.150UIp-p|
| 10:  800.0kHz    0.150UIp-p|
|**************************|
| Mode :                Meas|
| Dspl :          Meas(Graph)|
| Scale:               10dB|
|   G.751              (dB)|
|    -30  -20  -10   0    10 |
|    1+----+----+----+----+  |
|     |                   |  |
|     |                   |  |
|     |                   |  |
|   10+                   +  |
|     |                   |  |
|     |                   |  |
|     |                   |  |
|  100+                   +  |
|     |                   |  |
|     |                   |  |
|     |                   |  |
|   1k+                   +  |
|  ~~~~~~~~~~~~~~~~~~~~~~~~~  |
|     |                   |  |
|     |                   |  |
|  10M+----+----+----+----+  |
| (Hz)              UNLOCK  |
+--------+--------+--------+
```

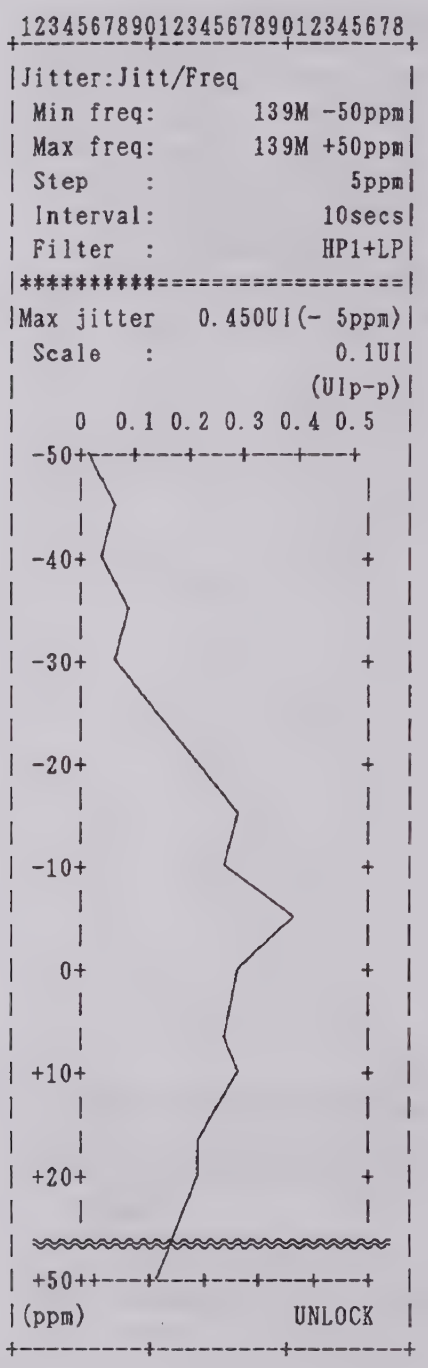
Printing format of the internal printer

```
1234567890123456789012345678901234567890
+--------+--------+--------+--------+
|Jitter:Transfer   Table: 34M-U  Point:10|
| 1: 10.0 Hz 15.00UI | 6:  6.0kHz 1.500UI|
| 2: 23.0 Hz 15.00UI | 7: 10.0kHz 0.150UI|
| 3:120.0 Hz 15.00UI | 8: 24.0kHz 0.150UI|
| 4:600.0 Hz 15.00UI | 9:100.0kHz 0.150UI|
| 5:  1.0kHz  6.92UI |10:800.0kHz 0.150UI|
|**************************************|
|Mode:Meas  Dspl:Meas(Graph)   Scale:10dB|
|  G.751                            (dB)|
|    -30     -20     -10      0      10 |
|    1+-------+-------+-------+-------+  |
|     |                               |  |
|     |                               |  |
|     |                               |  |
|     |                               |  |
|   10+                         o*    +  |
|     |                          *    |  |
|     |                         o*    |  |
|     |                          *    |  |
|     |                          *    |  |
|  100+                         o*    +  |
|     |                          *    |  |
|     |                          *    |  |
|     |                         o*    |  |
|     |                        *      |  |
|   1k+                   o*          +  |
|     |                *              |  |
|     |             *                 |  |
|     |          *                    |  |
|     |       o*                      |  |
|  ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~  |
|     |                               |  |
|  10M+-------+-------+-------+-------+  |
| (Hz)                          UNLOCK  |
+--------+--------+--------+--------+
```

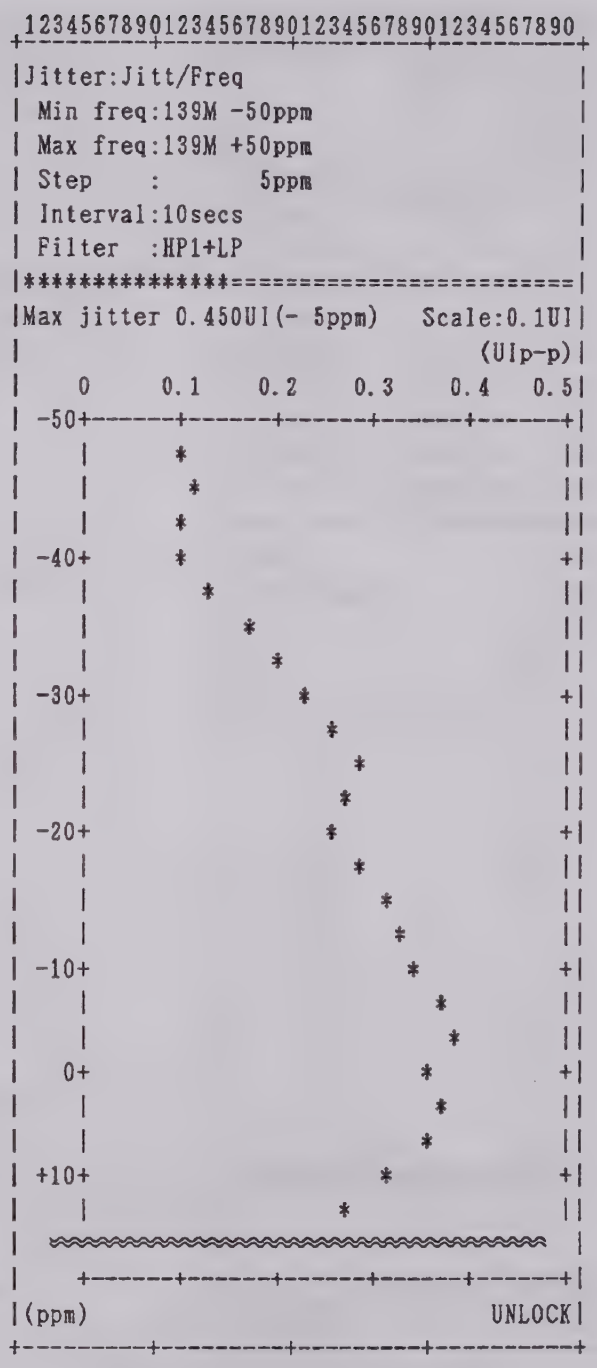
Printing format of the external printer

Fig. 5-125 Printing Format of the Jitter:Transfer Screen

● Jitter:Jitt/Freq screen



Printing format of the internal printer



Printing format of the external printer

Fig. 5-126 Printing Format of the Jitter:Jitt/Freq Screen

5.14.2 Automatic printing

Data is printed during a measurement in accordance with the automatic printing conditions set on the Setup:Print screen.

The following figures are printing format examples:

```
 1         10        20       28
+---------+---------+--------+
|****  Anritsu MP1520B   ****|
|Measuring condition          |
|            (Out-of-service)|
| Bit rate:            139Mb/s|
| DEMUX   :               OFF|
| Patt    :             Word16|
|       [1111 0000 1010 0101]|
| Frame   :                ON|
| Mode    :  Repeat [99 secs]|
| Jitt                       |
|  Meas mode:          Coupled|
|  Range    :             20UI|
|  Filter   :           HP1+LP|
|  Threshold:        10.0UIo-p|
|****************************|
|* 94-02-14 12:00:00 Start  *|
|****************************|
|02-14 12:00:06              |
|  Bit Err         1.42E+05  |
|  Code Err           12345  |
|  AIS139M         occur     |
|  RA 139M         recover   |
|02-14 12:00:22              |
|  Code Err        9.35E+05  |
|  Intermediate display omitted |
|****************************|
|* 94-02-14 12:00:37 saving *|
|****************************|
|02-14 12:00:52              |
|  AIS139M           recover |
|02-14 12:00:53              |
|  RA 139M           occur   |
|  RA 139M           recover |
|****************************|
|* 94-02-14 12:00:52 SaveOFF*|
|****************************|
|****************************|
|* 94-02-14 12:01:00 Accum  *|
|* (Interval:     1 secs )  *|
|****************************|
|Measured data               |
| Freq              - 12.3ppm|
+---------+---------+--------+
```

Measuring condition:
If Measuring Condition is set to ON, a measuring condition is printed first.

Measurement start time:
Data is printed when a measurement starts regardless of the settings.

Error/alarm:
Errors or alarms in one second are printed. The printing condition is in accordance with the Error Occurrence or Alarm Occurrence setting.

Paper saving:

If Paper Saving is set to ON and if errors exceeding the set threshold value occur continuously for ten seconds or more, the errors are not printed. In this case, alarms are printed.

If errors equal to or less than the set threshold value occur continuously for ten seconds or more, error printing is restarted.

Intermediate data:
Intermediate data is printed at the intervals set in Intermediate Data.

Intermediate data is printed in accordance with the Measured Data setting.

Fig. 5-109 Printing Format of the Internal Printer (1/2)

```
+1        10        20      28
| Errors                     |
|   Bit      EC        287   |
|            ER   2.35E-13   |
|            ES         12   |
|   Code     EC      20876   |
|            ER   3.35E-08   |
|            ES         12   |
|   FRM139M  EC          0   |
|            ER   0.00E-14   |
|            ES          0   |
| G.821 Performance          |
|   %ES            26.3821%  |
|   %SES            3.4748%  |
|   %DM            13.0432%  |
|   %US             0.0000%  |
| Alarm Seconds              |
|   Power                0s  |
|   LOS                  0s  |
|   AIS139M             27s  |
|   LOF139M              0s  |
|   RA 139M              6s  |
|   Patt                 0s  |
| Jitter                     |
|   Rx amptd       10.13UIp-p|
|      +Peak        5.06UI+p |
|      -Peak        5.07UI-p |
|   Hit count     1.23E+07   |
|   Hit seconds       1234   |
|   %Hit FS        68.1230%  |
|****************************|
|02-14 12:01:18              |
|  Bit Err        9.95E+08   |
|****************************|
|* 94-02-14 12:01:39 Stop   *|
|* (Interval:    99 hours)  *|
|****************************|
|Measured data               |
| Freq              - 12.3ppm|
| Errors                     |
|   BIT      EC   7.52E+09   |
|  Intermediate display omitted |
|   %Hit FS        68.1230%  |
|****************************|
|* 94-02-14 12:01:39 Start  *|
|****************************|
|  Subsequent display omitted |
+---------+---------+--------+
```

Intermediate Data (continued)

Measurement end time:
A measurement end time is printed when a measurement ends, regardless of the settings.

Measured result data:
If the Measured Data setting is set to other than OFF, a measured result is printed in accordance with the Measured Data setting.

Fig. 5-109 Printing Format of the Internal Printer (2/2)

```
+1--------10--------20--------30--------40+
|***  Anritsu MP1520B PDH Analyzer  ***  |
|Measuring condition (Out-of-service)    |
|  Bit rate: 139Mb/s                     |
|  DEMUX   :                       OFF   |
|  Patt    :  Word16 [1111000010100101]  |
|  Frame   :      ON                     |
|  Mode    :  Repeat          [99 hours] |
|  Jitt                                  |
|    Meas mode:                  Coupled |
|    Range    :                    20UI  |
|    Filter   :                  HP1+LP  |
|    Threshold:               10.0UIo-p  |
|****************************************|
|***   94-02-14 12:00:00 Start      ***  |
|****************************************|
|02-14 12:00:06  Bit Err      1.45E+08   |
|                Code Err     9.21E+12   |
|                AIS139M      occur      |
|                RA 139M      recover    |
|02-14 12:00:22  Code Err     9.33E+12   |
|        Intermediate display omitted    |
|****************************************|
|**  94-02-14 12:00:37 saving Start  **  |
|****************************************|
|02-14 12:00:52  AIS139M      recover    |
|02-14 12:00:53  RA 139M      occur      |
|                RA 139M      recover    |
|****************************************|
|**  94-02-14 12:00:37 Saving Stop   **  |
|****************************************|
|****************************************|
|**  94-02-14 12:01:00 Accumulative  **  |
|**    (Interval:     1 secs )       **  |
|****************************************|
|Measured data                           |
|  Freq  - 12.3ppm                       |
| Errors                                 |
|   Bit       EC                   287   |
|             ER               2.32E-13  |
|             ES                    12   |
|   Code      EC                 20876   |
|             ER               3.39E-08  |
|             ES                     2   |
|   FRM139M   EC                     0   |
|             ER               0.00E-14  |
|             ES                     0   |
+---------+---------+---------+----------+
```

Measuring condition:
If Measuring Condition is set to ON, a measuring condition is printed first.

Measurement start time:
A measurement start time is printed when a measurement starts, regardless of the settings.

Error/alarm:
Errors or alarms in one second are printed in accordance with the Error Occurrence or Alarm Occurrence setting.

Paper saving:
If Paper Saving is set to ON and if errors exceeding the set threshold value occur continuously for ten seconds or more, the errors are not printed. In this case, alarms are printed.

If errors equal to or less than the set threshold value occur continuously for ten seconds or more, error printing is restarted.

Intermediate data:
Intermediate data is printed at the intervals set in Intermediate Data.

Intermediate data is printed in accordance with the Measured Data setting.

Fig. 5-110 Printing Format of the External Printer (1/2)

```
1         10        20        30        40
+---------+---------+---------+---------+
| G.821 Performance                     |
|           %ES              26.3821%   |
|           %SES              3.4748%   |
|           %DM              13.0432%   |
|           %US               0.0000%   |
|                                       |
| Alarm Seconds                         |
|           Power                  0s   |
|           LOS                    0s   |
|           AIS139M               27s   |
|           LOF139M                0s   |
|           RA 139M                6s   |
|           Patt                   0s   |
|                                       |
| Jitter                                |
|           Rx amptd        10.13UIp-p  |
|              +Peak         5.06UI+p   |
|              -Peak         5.07UI-p   |
|           Hit count      1.23E+07     |
|           Hit seconds       1234      |
|           %Hit FS         68.1230%    |
|***************************************|
|02-14 12:01:18  Bit Err      9.82E+08  |
|***************************************|
|***   94-02-14 12:01:39  Stop      ***  |
|***   (Interval:     1 secs )      ***  |
|***************************************|
|Measured data                          |
|  Freq  -12.3ppm                       |
|                                       |
|  Errors                               |
|        Intermediate display omitted   |
|           %Hit FS         68.1230%    |
|***************************************|
|***   94-02-14 12:01:39  Start     ***  |
|***************************************|
|        Subsequent display omitted     |
+---------+---------+---------+---------+
```

Intermediate Data (continued)

Measurement end time:
A measurement end time is printed when a measurement ends, regardless of the settings.

Measured result data:
If the Measured Data setting is set to other than OFF, a measured result is printed in accordance with the Measured Data setting.

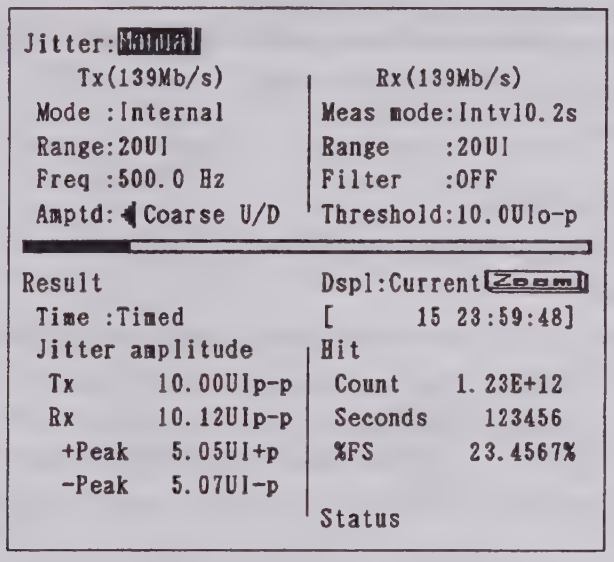
Fig. 5-110 Printing Format of the External Printer (2/2)

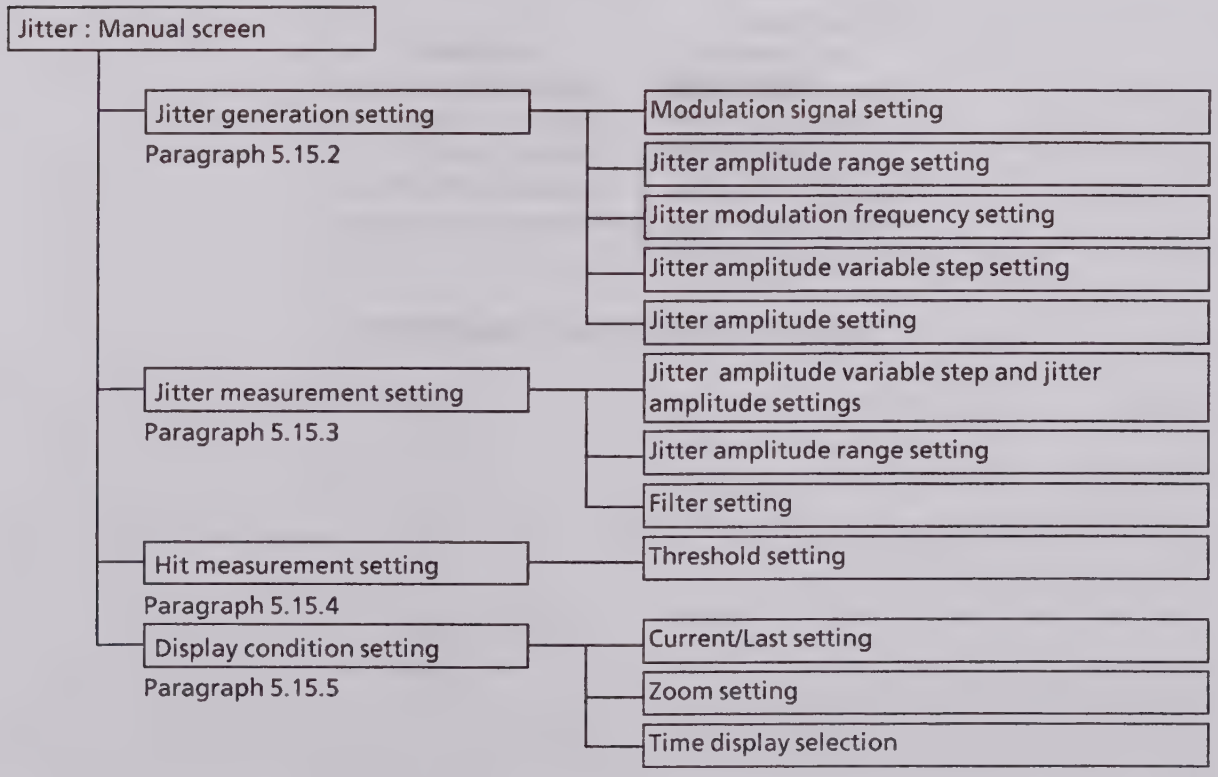
5.15 Settings on the Jitter:Manual Screen

5.15.1 Functions

Setting relating to the jitter generation/measurement are conducted on this screen and the status indicated.

The Jitter:Manual screen and settings are as follows:





Notes: • *This screen is displayed only when the jitter generation/measurement option is installed.*

• *The bit rate set on the Condtn screen is indicated on the second line of this screen.*

5.15.2 Jitter Generation Setting

Settings relating to jitter modulation frequency and amplitude needed for jitter generation are set here.

[Settable items] The following item can be set:

- Modulation signal setting
- Jitter amplitude range setting
- Jitter modulation frequency setting
- Jitter amplitude variable step setting
- Jitter amplitude variable step and jitter amplitude settings

[Related item] The following item affects this setting:

- Bit rate

(1) Modulation signal setting:

Select the internal or external signal for jitter modulation.

Setting ranges are as follows:

[Setting ranges]

Internal	:	Jitter modulation is conducted using the internal signal.
Ext (>=10 Hz)	:	Jitter modulation is conducted using an external signal of 10 Hz or more.
Ext (<10 Hz)	:	Jitter modulation is conducted using an external signal of below 10 Hz.

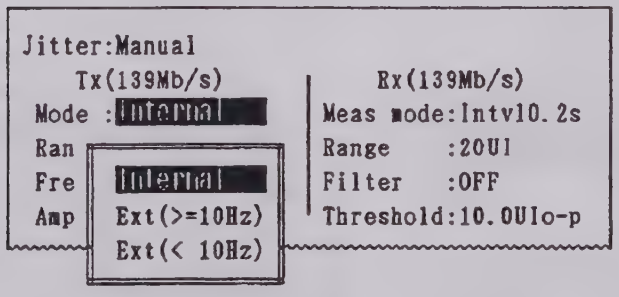


Fig. 5-127 Modulation Signal Setting

(2) Jitter amplitude range setting:

Set a jitter amplitude range.

Setting ranges are as follows:

[Setting ranges] 20 UI : Jitter amplitude may be set within a range between 0.00 and 20.20 UI_{p-p}.

2 UI : Jitter amplitude may be set within a range between 0.00 and 2.020 UI_{p-p}.

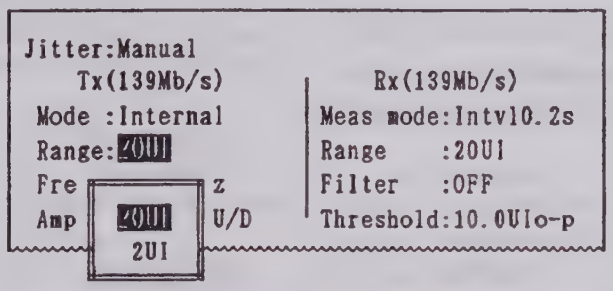


Fig. 5-128 Jitter Amplitude Range Setting

Note: *When the jitter amplitude range is changed, the applicable jitter modulation frequency range changes accordingly.*

(3) Jitter modulation frequency setting:

Sets the jitter modulation frequency.

Setting ranges are as follows:

[Setting ranges] 2 Hz to 99 Hz/Step 1 Hz

100 Hz to 990 Hz/Step 10 Hz

1 kHz to 9.9 kHz/Step 0.1 kHz

10 kHz to 99 kHz/Step 1 kHz

100 kHz to 990 kHz/Step 10 kHz

1 MHz to 4 MHz/Step 0.1 MHz

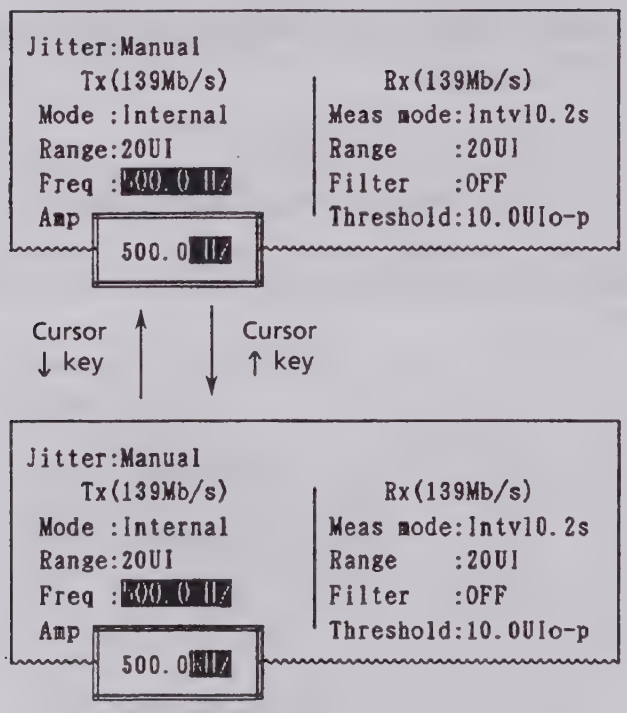


Fig. 5-129 Jitter Modulation Frequency Setting

Notes: • *The jitter modulation frequency is restricted by the bit rate being set on the Condtn screen.*

• *Any values may be entered into the window, however, values are converted to those within the specified setting range. Example: 123.4 Hz is converted to 120.0 Hz.*

(4) Jitter amplitude variable step and jitter amplitude settings

Sets the variable step and jitter amplitude for the jitter amplitude setting.

Setting ranges are as follows:

[Setting ranges] Jitter amplitude variable steps

Fine: Changes the jitter amplitude by small steps.
Coarse: Changes the jitter amplitude by large steps.

Jitter amplitude
Range of 0.00 to 20.20 UI_{P-P}
Range of 0.000 to 2.020 UI_{P-P}

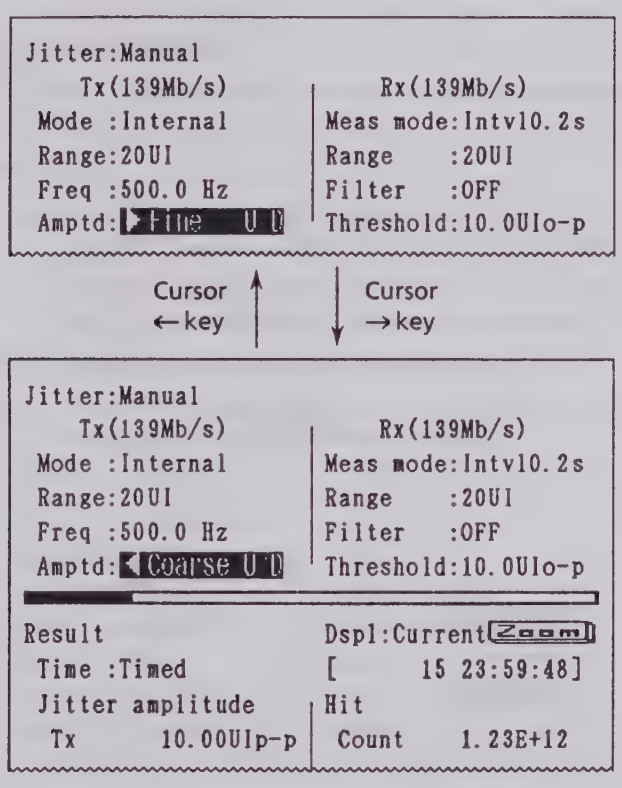


Fig. 5-130 Jitter Amplitude Setting

When the Set key is pressed when the reversed cursor is on the above position, the reversed cursor blinks. Then, set a variable step and jitter amplitude using the cursor key.

←/→: variable step setting
↑/↓ : jitter amplitude setting

Notes: • *The applicable jitter amplitude range is restricted by the bit rate being set on the Condtn screen and the jitter modulation signal frequency.*

• *Although settings on this screen can be carried out, no jitters are added to the output signal when OFF is set on the Condtn/Result screen.*

• *The set jitter amplitude value can be monitored at TxAmptd on the Result screen. The indicated value is renewed every 1 second when the modulation signal frequency is below 10 Hz or every 0.2 seconds when the frequency is 10 Hz or more.*

(Blank)

5.15.3 Jitter measurement setting

Settings for jitter measurement are conducted here.

[Settable items] The following item can be set:

- Jitter measurement mode setting
- Jitter amplitude range setting
- Filter setting

[Related item] The following item affects this setting:

- Bit rate
- Error measurement time

(1) Jitter measurement mode setting:

Sets the jitter measurement period. The maximum peak-to-peak value within this period is indicated as the jitter amplitude.

Setting ranges are as follows:

[Setting ranges]

Intvl 0.2 s: Sets the measurement interval to 0.2 sec. This is selected mainly when the jitter modulation signal frequency is 10 Hz or more.

Intvl 1 s : Sets the measurement interval to 1 sec. This is selected mainly when the jitter modulation signal frequency is below 10 Hz.

Intvl 10 s : Sets the measurement interval to 10 sec.

Coupled : Sets the measurement interval equal to the error measurement time being set on the Condtn/Result screen.

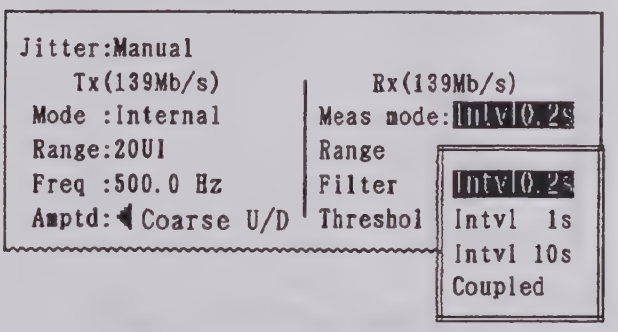


Fig. 5-131 Jitter Measurement Interval Setting

Notes: • *Jitter measurement modes are selected as follows:*

Intvl 0.2 s, 1 s : Used to measure jitter amplitude values at the shortest intervals. This mode is used for the jitter amplitude display at the transmitter.

Intvl 10 s : Used to obtain the maximum jitter amplitude value during 10 seconds.

Coupled : Used to measure jitter in linkage with the error measurement. In this mode, the maximum jitter within the error measurement time is indicated.

• *The maximum jitter amplitude within the measurement time can be saved in the internal memory or printed out by the printer as a part of measurement result data, only when the jitter measurement mode is set to Coupled.*

(2) Jitter amplitude range setting:

Sets the jitter amplitude measurement range.

Setting ranges are as follows:

[Setting ranges] 20 UI : The applicable jitter amplitude range is between 0.00 and 20.20 UI_{P-P}.

2 UI : The applicable jitter amplitude range is between 0.000 and 2.020 UI_{P-P}.

Auto : The applicable jitter amplitude range is between 0.000 and 20.20 UI_{P-P}.

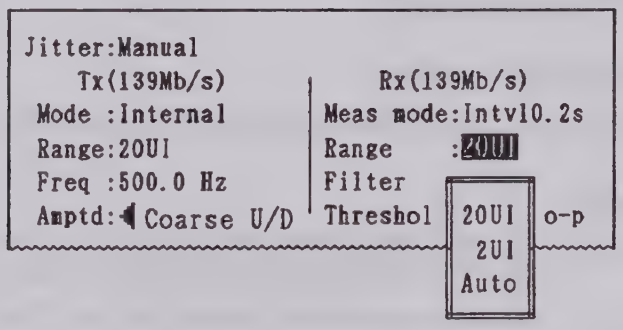


Fig. 5-132 Jitter Amplitude Range Setting

(3) Filter setting:

Sets the filter for jitter amplitude measurement.

Setting ranges are as follows:

[Setting ranges]

OFF	:	No filter is used.
HP1	:	High-pass filter 1 is used.
HP2	:	High-pass filter 2 is used.
HP2 (N)	:	High-pass filter 2 (N) is used.
LP	:	Low-pass filter is used.
HP1 + LP	:	High-pass filter 1 and low-pass filter are used.
HP2 + LP	:	High-pass filter 2 and low-pass filter are used.
HP2 (N) + LP	:	High-pass filter 2 (N) and low-pass filter are used.

(N) is for the National interface and used only for 2M and 8M.

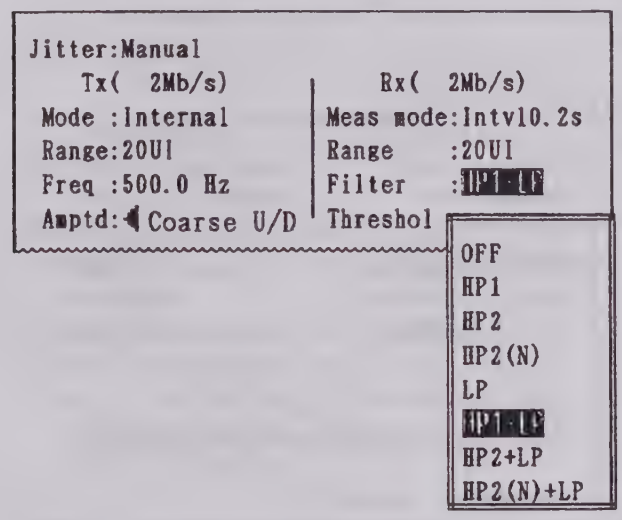


Fig. 5-133 Filter Setting

Notes: • *When a positive or negative peak of jitter amplitude exceeds a half the maximum of each range, overflow occurs to the peak value indication. (Example display: >1.855 UI_{P-P})*

• *When Auto is selected as the jitter amplitude range, the following hysteresis applies to range switching:*
From 2 UI to 20 UI: Switched when + peak or − peak exceeds 1.000 UI_{0-P}.
From 20 UI to 2 UI: Switched when both the + peak and − peak exceed 0.90 UI_{0-P}.

5.15.4 Hit measurement setting

Settings for Hit measurement are conducted here.

[Settable items] The following item can be set:

- Threshold setting

[Related item] The following item affects this setting:

- Jitter amplitude range of receiver

(1) Threshold setting:

Sets the threshold for Hit judgment. Jitters (positive and negative) exceeding the following thresholds are counted.

Setting ranges are as follows:

[Setting ranges] For 2 UI range : 0.05 to 1.00 $UI_{0\text{-}P}$/Step 0.01 $UI_{0\text{-}P}$

For 20 UI range : 0.5 to 10.0 $UI_{0\text{-}P}$/Step 0.1 $UI_{0\text{-}P}$

Not applicable for Auto mode.

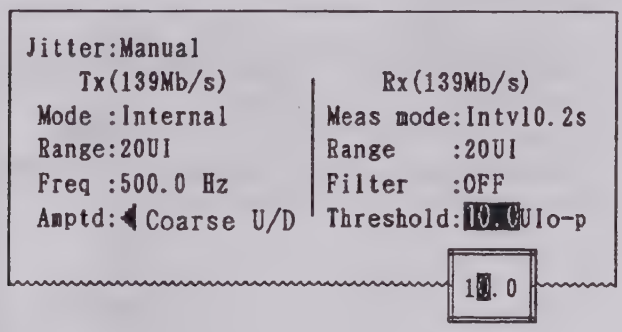


Fig. 5-134 Threshold Setting

Note: *The Hit measured value can be saved in the internal memory or printed out by the printer as a part of measurement result data.*

5.15.5 Display condition setting

Settings for jitter measurement and Hit measurement and display are conducted here.

[Settable items] The following item can be set:

- Current/Last setting
- Zoom setting
- Time display selection

[Related item] The following item affects this setting:

- Error measurement time
- Jitter measurement mode for receiver
- Jitter amplitude range for receiver

(1) Current/Last setting:

Sets the Jitter amplitude and Hit measurement result display method for the receiver.

Setting ranges are as follows:

[Setting ranges]

Current : Values during measurement are indicated. Measured values of jitter amplitude and Hit count are renewed every 0.2 seconds while those of Hit Seconds and %Hit FS are renewed every 1 second. The displayed jitter amplitude value changes only when the maximum value is renewed during the measurement period.

Last : No values during measurement are indicated. Indicated values are changed after expiration of time being set to the measurement mode.

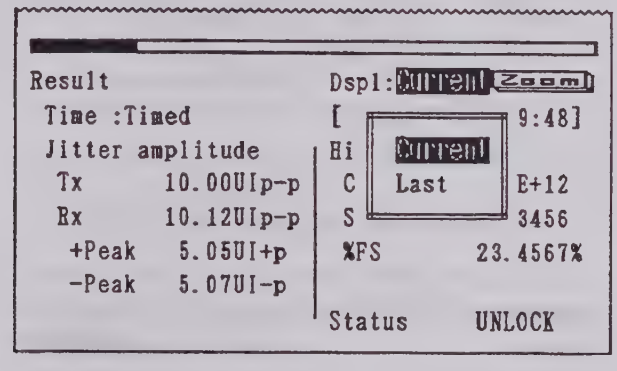


Fig. 5-135 Current/Last Setting

Notes:

- *Jitter amplitude indication at the transmitter is renewed at the interval explained in 5.15.2 (1), regardless of settings here. (<10 Hz: 1 sec, ≧10 Hz: 0.2 sec)*
- *When Current is selected as the Dspl (display), the maximum value of jitter measurement within the measurement period is indicated while an accumulated value of Hit measurement within the measurement period is indicated.*
- *When jitter measurement locking is released at the receiver, "Status UNLOCK" is indicated on the lower-most line of Result screen. When Dspl of the receiver is set to Current, the UNLOCK message flashes while the locking is released. When Dspl is set to Last, an inverted UNLOCK message is indicated during the next measurement period. No UNLOCK message appears when locking is not released.*
- *When Auto is selected as the jitter amplitude range for the receiver, Hit Count, Hit Seconds and %Hit FS are not indicated.*
- *Changing the measurement mode, range filter or threshold setting of the receiver restarts the measurement.*

(2) Zoom setting:

Set whether or not measurement results are indicated after zooming. Two of the following items can be selected for zoom display.

Setting ranges are as follows:

[Setting ranges]

Tx amptd	:	Transmitter jitter amplitude
Rx amptd	:	Receiver jitter amplitude
Rx + peak	:	Receiver positive jitter amplitude
Rx − peak	:	Receiver negative jitter amplitude
Hit count	:	Total number of jitter pulses exceeding the threshold
Hit secs	:	Total number of seconds with 1 Hit Count or more
%Hit FS	:	Ratio of seconds without Hit Seconds against total measurement time

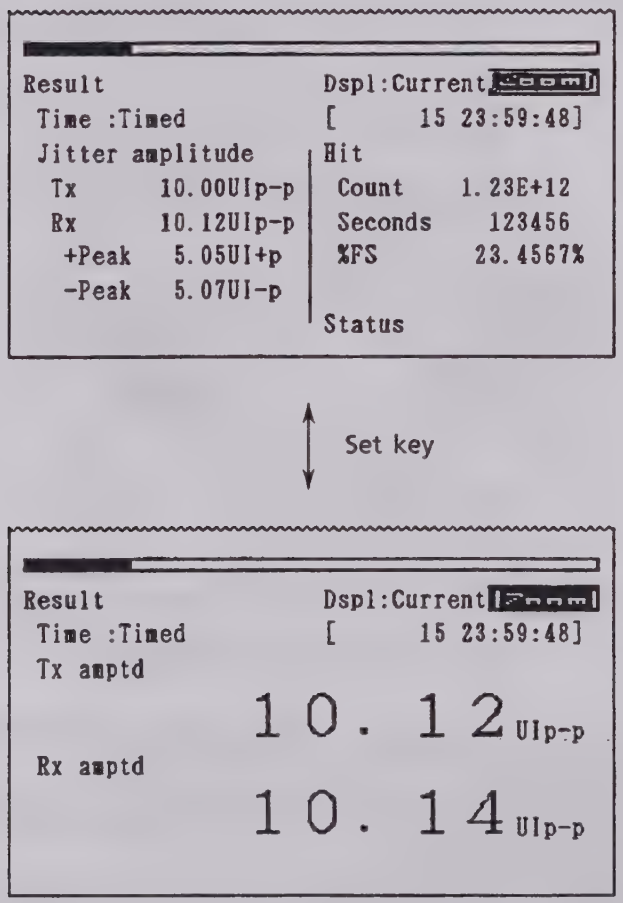


Fig. 5-137 Zoom Setting

Note: When Auto is selected for the receiver jitter amplitude range, the Hit count, Hit secs and %Hit FS are not indicated.

(3) Time display selection:

Conduct the setting relating to the measurement time.

Setting ranges are as follows:

[Setting ranges]

Elapsed : Indicates the elapsed error measurement time from start of measurement until the present.
Indicates the elapsed time of Hit measurement and receiver jitter amplitude measurement with Measurement mode being set to Coupled.

Timed : Indicates the remaining time of error measurement from the present until the end of measurement.
Indicates the remaining time of Hit measurement and receiver jitter amplitude measurement with Measurement mode being set to Coupled.

Date & Time: Indicates the current time.

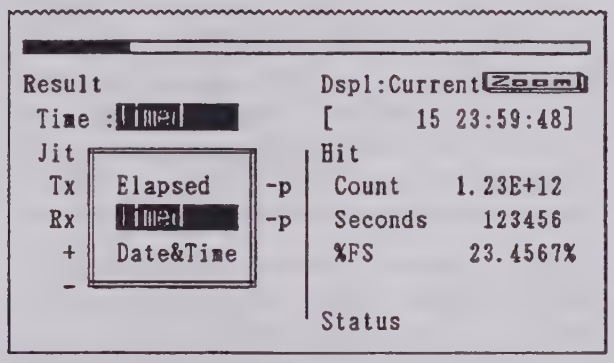


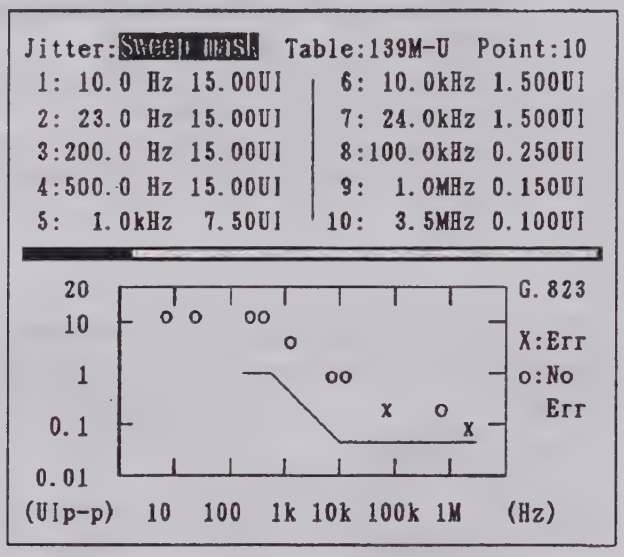
Fig. 5-138 Time Display Selection

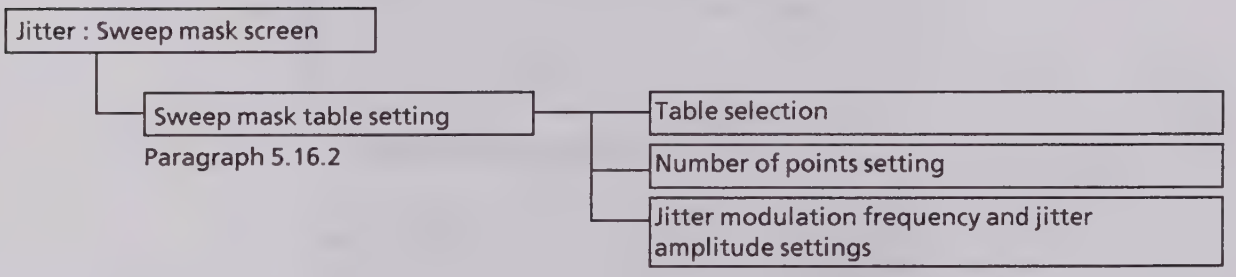
5.16 Settings on the Jitter:Sweep mask Screen

5.16.1 Functions

Settings relating to the Sweep mask for measuring the jitter tolerance are conducted on this screen and the status indicated.

The Jitter:Sweep mask screen and settings are as follows:




Jitter : Sweep mask screen
Sweep mask table setting
Paragraph 5.16.2
Table selection
Number of points setting
Jitter modulation frequency and jitter amplitude settings

Note: *This screen is indicated only when the jitter generator/measurement option is installed.*

5.16.2 Sweep mask table setting

Conduct settings for creating the sweep mask table here.

[Settable items] The following item can be set:

- Table selection
- Number of points setting
- Jitter modulation frequency and jitter amplitude settings

[Related item] The following item affects this setting:

- Bit rate

(1) Table selection:

There are a fixed table which cannot be changed and a variable table which can be changed freely, for each bit rate.

As the bit rate, the bit rate value being set on the Condtn screen is indicated, with the setting ranges as shown below.

Setting ranges are as follows:

[Setting ranges]

R : Fixed table, meeting ITU-T G.823.

N : Fixed table, meeting National network of ITU-T G823. This can be selected only when the bit rate is 2 and 8 Mb/s.

U : Optionally selectable table.

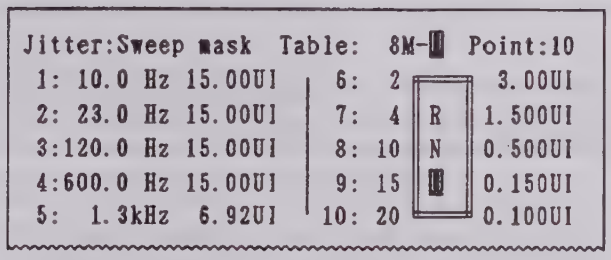


Fig. 5-139 Table Selection

(2) Number of points setting:

Indicates the number of measurement points. When table R or N is selected, the number of points is not indicated.

Setting ranges are as follows:

[Settable items] 1 to 10

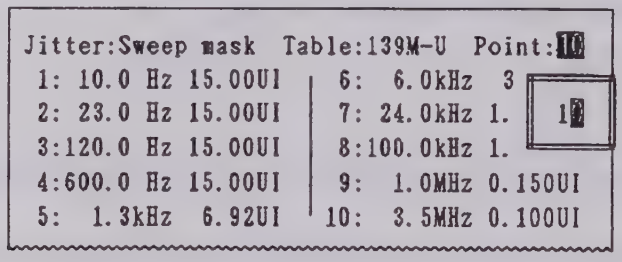


Fig. 5-140 Number of Points Setting

(3) Jitter modulation frequency and jitter amplitude settings

Sets the jitter modulation frequency and jitter amplitude against the output signal. Settings are enabled only when table U is selected.

Setting ranges are as follows:

[Setting ranges] Jitter modulation frequency : 2 Hz to 99 Hz/Step 1 Hz
100 Hz to 990 Hz/Step 10 Hz
1 kHz to 9.9 kHz/Step 0.1 kHz
10 kHz to 99 kHz/Step 1 kHz
100 kHz to 990 kHz/Step 10 kHz
1 MHz to 4 MHz/Step 0.1 MHz

Jitter amplitude : 0 to 20.20 UI

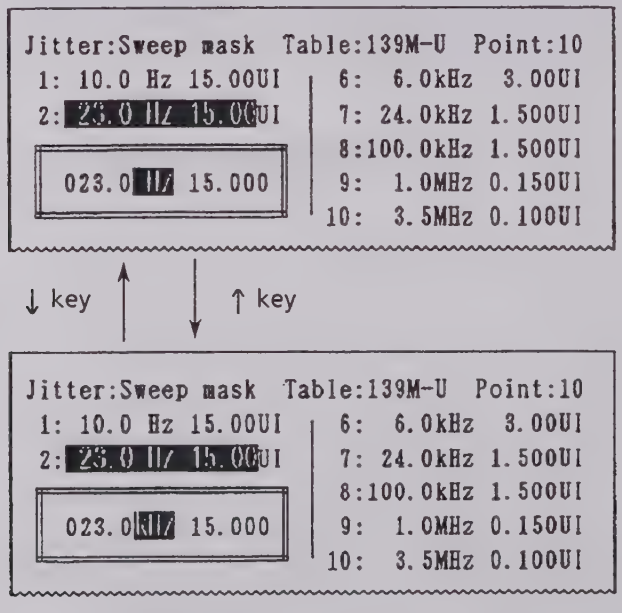


Fig. 5-141 Jitter Modulation Frequency and Jitter Amplitude

Measurement initiates upon pressing Start/Stop key. When the key is pressed again during measurement, measurement is halted at that time according to the setting. Pressing the key a third time initiates measurement from the beginning.

Measurement results are indicated as shown below. A circle or cross mark is indicated upon measurement of each point.

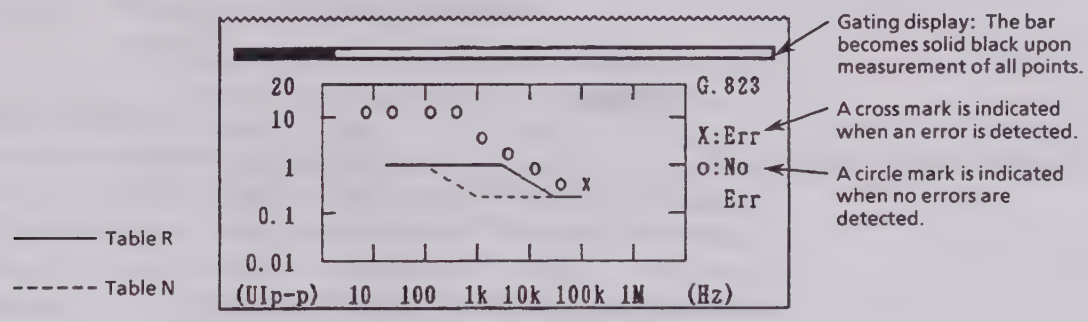


Fig. 5-142 Display of Sweep mask Measurement Results

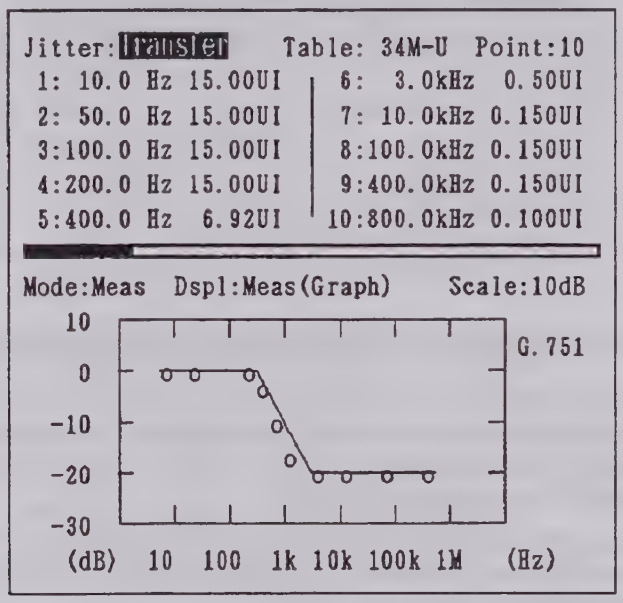
Notes:
- *Any values may be entered onto the window for each digit of the jitter modulation frequency and jitter amplitude, they are converted to values within the setting range when saving data. Example: 12.345 UI is converted to 12.34 UI.*
- *When measurement is initiated, the frequency offset is set to 0 ppm, error/alarm addition to OFF, jitter generation to ON, measurement range to Auto, and filter to OFF as common settings for the transmitter and receiver.*
- *Even if the Start/stop key LED lights when the screen is changed to this screen during measurement at other screens, other measurement continues and the Sweep mask measurement is not executed. In this case, press the Start /Stop key once to stop measurement, and then press the same key again to start the Sweep mask measurement.*

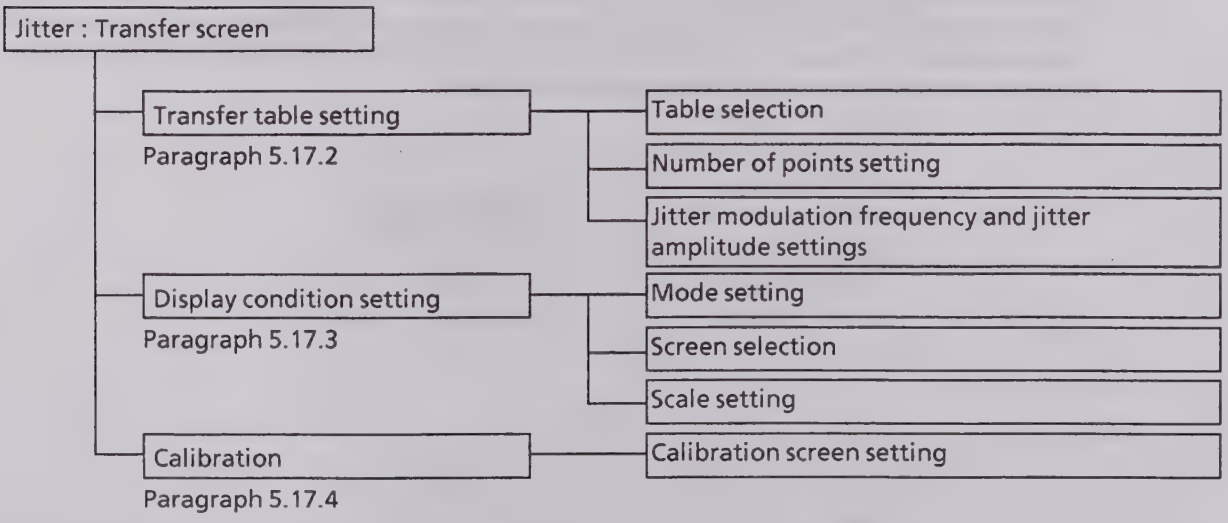
5.17 Settings on the Jitter:Transfer Screen

5.17.1 Functions

Settings for the jitter transfer characteristic measurement is conducted on this screen and the status indicated.

The Jitter:Transfer screen and settings are as follows:





Note: *This screen is indicated only when the jitter generator/measurement option is installed.*

5.17.2 Transfer table setting

Settings for creating the transfer table are conducted here.

[Settable items] The following item can be set:

- Table selection
- Number of points setting
- Jitter modulation frequency and jitter amplitude settings

[Related item] The following item affects this setting:

- Bit rate

(1) Table selection:

There are a fixed table which cannot be changed and a variable table which can be changed freely, for each bit rate. For 139 Mb/s, however, only variable table is available.

As the bit rate, the bit rate value being set on the Condtn screen is indicated.

Setting ranges are as follows:

[Setting ranges] R : Fixed table, meeting the following standards:
2 Mb/s : ITU-T G.742
8 Mb/s : ITU-T G.751
34 Mb/s : ITU-T G.751

S : Fixed table, meeting ITU-T G736. This can be selected only when the bit rate is 2 Mb/s.

U : Optionally selectable table

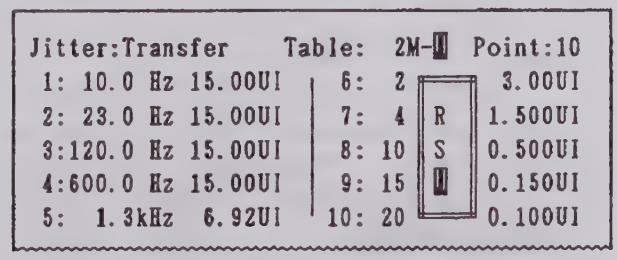


Fig. 5-143 Table Selection

(2) Number of points setting:

Indicates the number of measurement points. When table R or S is selected, the number of points is not indicated.

Setting ranges are as follows:

[Settable items] 1 to 10

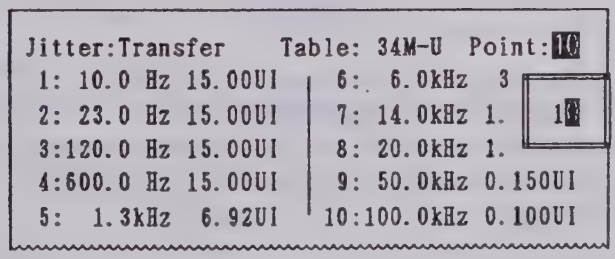


Fig. 5-144 Number of Points Setting

(3) Jitter modulation frequency and jitter amplitude settings

Sets the jitter modulation frequency and jitter amplitude against the output signal. Settings are enabled only when table U is selected.

Setting ranges are as follows:

[Setting ranges] Jitter modulation frequency : 2 Hz to 99 Hz/Step 1 Hz
100 Hz to 990 Hz/Step 10 Hz
1 kHz to 9.9 kHz/Step 0.1 kHz
10 kHz to 99 kHz/Step 1 kHz
100 kHz to 990 kHz/Step 10 kHz
1 MHz to 4 MHz/Step 0.1 MHz

Jitter amplitude : 0 to 20.20 UI

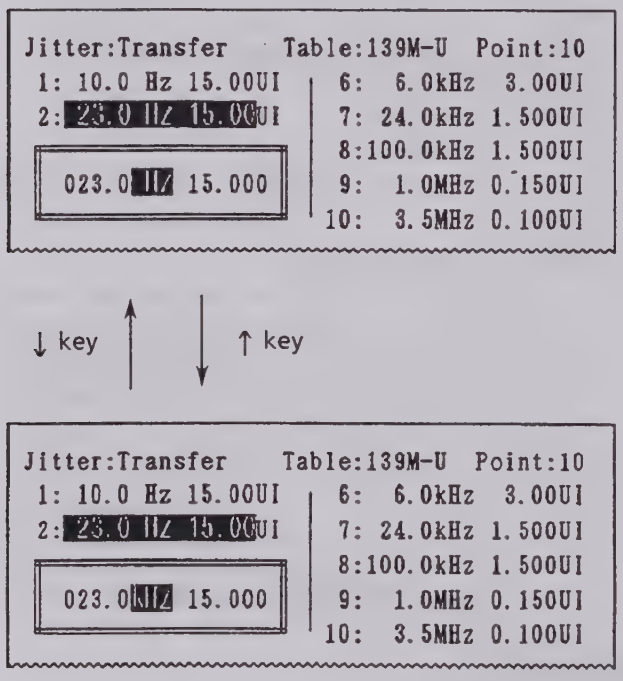


Fig. 5-145 Jitter Modulation Frequency and Jitter Amplitude

Notes:
- *Any values may be entered onto the window for each digit of the jitter modulation frequency and jitter amplitude, they are converted to values within the setting range when saving data. Example: 12.345 UI is converted to 12.34 UI.*
- *When the table type or contents (frequency, jitter amplitude or number of points) are changed, Calibration values are reset upon initiation of measurement. (Values are reset to 0.00 dB.)*
- *When measurement is initiated, the frequency offset is set to 0 ppm, error/alarm addition to OFF, jitter generation to ON, measurement range to Auto, and filter to OFF as common settings for the transmitter and receiver.*

5.17.3 Display condition setting

Settings of display conditions for the Transfer measurement are conducted here.

[Settable items] The following item can be set:

- Mode setting
- Screen selection
- Scale setting

[Related item] The following item affects this setting:

- Bit rate

(1) Mode setting:

Selects the measurement and Calibration modes.

Setting ranges are as follows:

[Setting ranges] Meas : Conducts the Transfer measurement.

Cal : Conducts the Calibration measurement. For details, refer to 5.17.4.

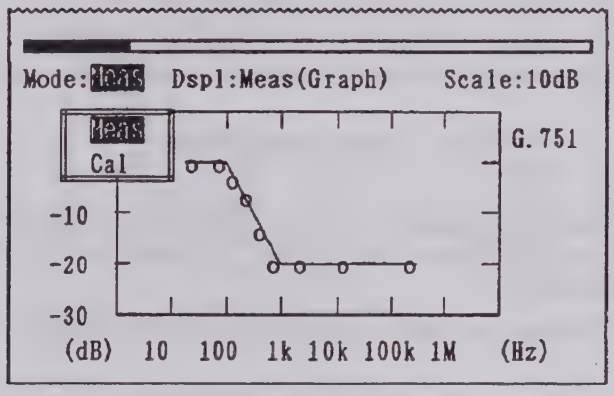


Fig. 5-146 Mode Setting

(2) Screen selection:

Selects the contents to be indicated. This is indicated only when mode (1) is set to Meas.

Setting ranges are as follows:

[Settable items] Meas (Graph) : Indicates Transfer measurement data by a graph.

Meas (Table) : Indicates Transfer measurement data by numerals.

Cal (Table) : Indicates Calibration value by numerals.

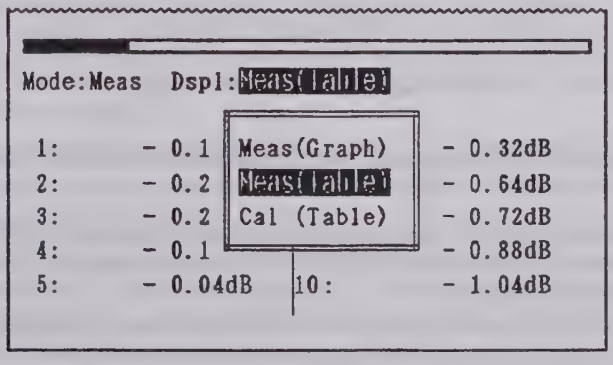


Fig. 5-147 Screen Selection

(3) Scale setting:

Sets the scale when the screen displays a graph.

Setting ranges are as follows:

[Settable items] 10 dB : One graduation is set to 10 dB.
1 dB : One graduation is set to 1 dB.

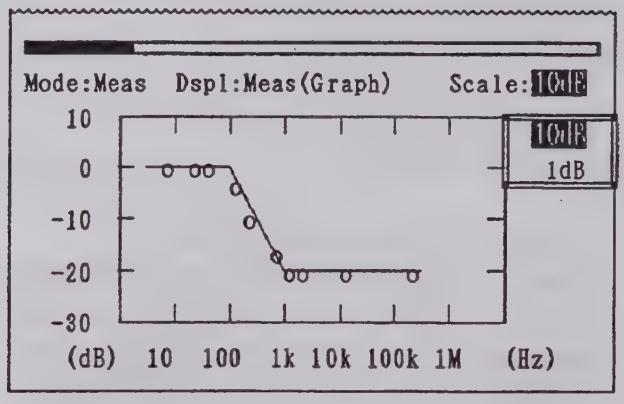


Fig. 5-148 Scale Setting

Pressing Start/Stop key initiates the measurement. Pressing the key again during measurement halts the measurement at that time according to the setting. Pressing the key a third time initiates the measurement from the beginning.

Measurement results are indicated as shown below. A circle mark is indicated upon measurement of each point.

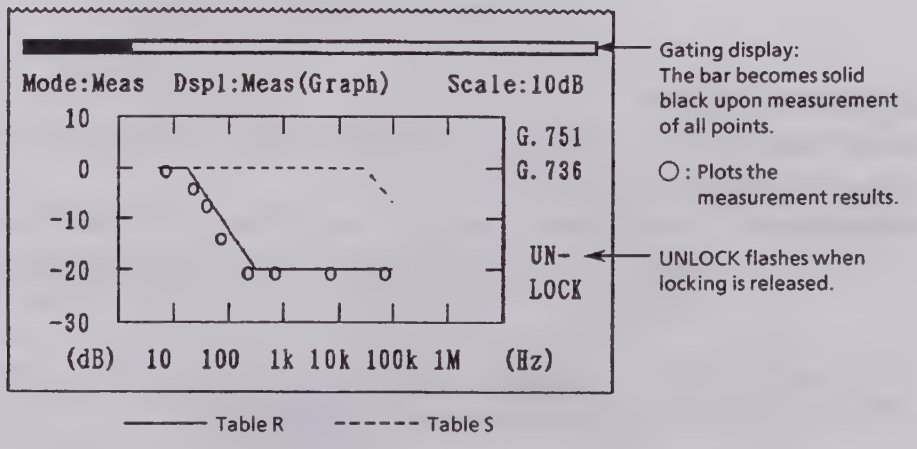


Fig. 5-149 Display of Transfer Measurement Results

Notes:
- *When an abnormal value is measured (such as 0 jitter amplitude of the transmitter, a jitter amplitude exceeding the specified range at the receiver, etc.), a cross mark is indicated on the upper or lower edge of the graph.*
- *Even if the Start/stop key LED lights when the screen is changed to this screen during measurement at other screens, other measurement continues and the Transfer measurement is not executed. In this case, press the Start /Stop key once to stop measurement, and then press the same key again to start the Transfer measurement.*

5.17.4 Calibration

Settings for Calibration are conducted here.

[Settable items] The following item can be set:

- Calibration screen setting

[Related item] The following item affects this setting:

- Bit rate

(1) Calibration screen setting:

Setting ranges are as follows:

[Setting ranges] Meas : Conducts the Transfer measurement. As for details, refer to 5.17.3.

Cal : Conducts the Calibration measurement.

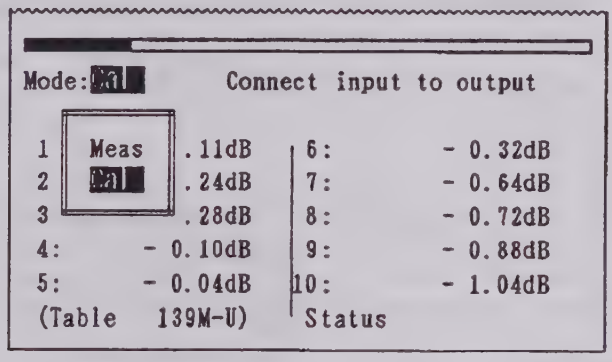


Fig. 5-150 Calibration Screen Setting

When Start/Stop key is set to start (the green LED turns on) with the mode set to Cal, Calibration is initiated.

Notes: • *When the I/O cable is disconnected upon initiation of Calibration, a "Connect input to output" message flashes.*

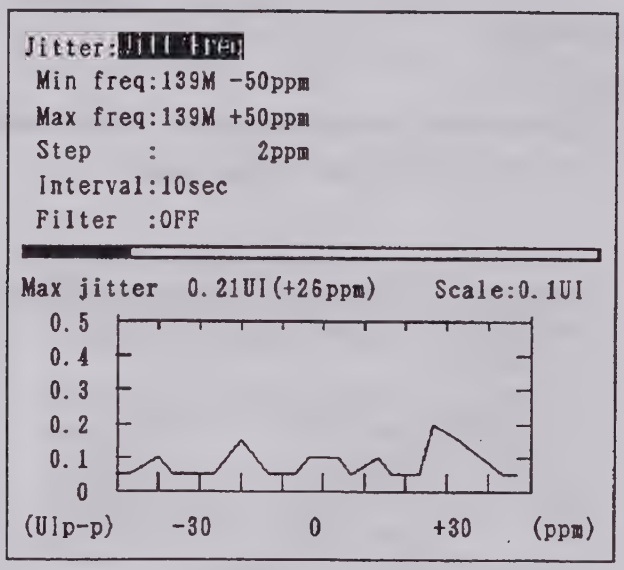
- *Calibration is carried out only for bit rates listed in the Table on this screen.*
- *When Calibration is initiated, preceding Calibration values are reset. If Calibration is halted mid way, 0.00 dB is entered to points to which calibration has not been complete.*
- *When jitter measurement locking is released during Calibration, the Status UNLOCK flashes at the lower-most line of the screen.*
- *When the table type or contents (frequency, jitter amplitude or number of points) are changed, calibration values are reset upon initiation of measurement. (Values are reset to 0.00 dB.)*
- *There is one Calibration value for each bit rate. As for R, S and U (139M-U, etc.), only one of them can be used. Therefore, when the Transfer measurement is to be executed using 34M-U after calibration by 34M-R, conduct calibration by 34M-U again before initiating measurement. Unless 34M-U Calibration is conducted at this time, all 34M-U Calibration values are reset to 0.00 dB.*

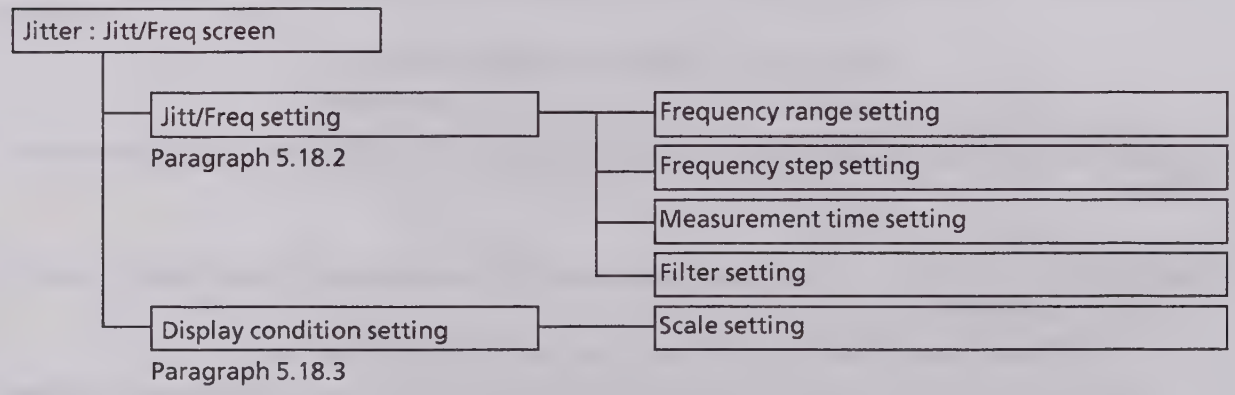
5.18 Settings on the Jitter:Jitt/Freq Screen

5.18.1 Functions

Settings for frequency-jitter amplitude characteristic measurement are conducted on this screen and the status indicated.

The Jitter:Jitt/Freq screen and settings are as follows:





Note: *This screen is indicated only when both the frequency offset and jitter generation/measurement options are installed.*

5.18.2 Jitt/Freq setting

Conduct settings for frequency-jitter amplitude characteristic measurement here.

[Settable items] The following item can be set:

- Frequency range setting
- Frequency step setting
- Measurement time setting
- Filter setting

[Related item] The following item affects this setting:

- Bit rate

(1) Frequency range setting:

Sets the frequency variable range. Enter the minimum and maximum values independently.

Setting ranges are as follows:

[Setting ranges] Min freq : −50 to +49 ppm

Max freq: −49 to +50 ppm
Here, maximum frequency must be greater than the minimum.

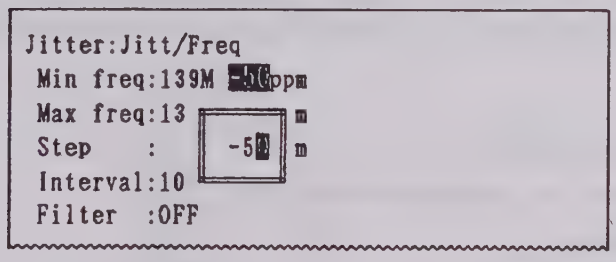


Fig. 5-151 Frequency Range Setting

(2) Frequency step setting:

Sets the frequency changing step.

Setting ranges are as follows:

[Settable items] 1 to 100 ppm

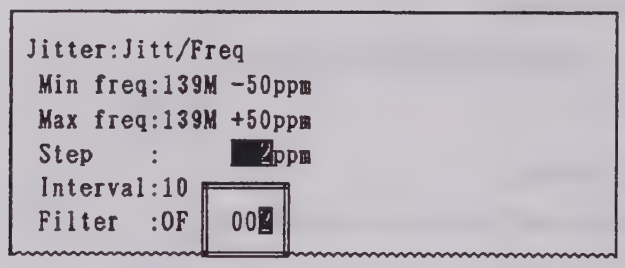


Fig. 5-152 Number of Points Setting

Notes: • *As the frequency, the bit rate being set on the Condtn screen is indicated.*

• *When measurement is initiated, error/alarm addition to OFF, the jitter generation is set to ON, measurement range to Auto, and filter to OFF as common settings for the transmitter and receiver.*

(3) Measurement time setting:

Sets the jitter measurement time against the set frequency.

Setting ranges are as follows:

[Setting ranges] 1 to 60 seconds

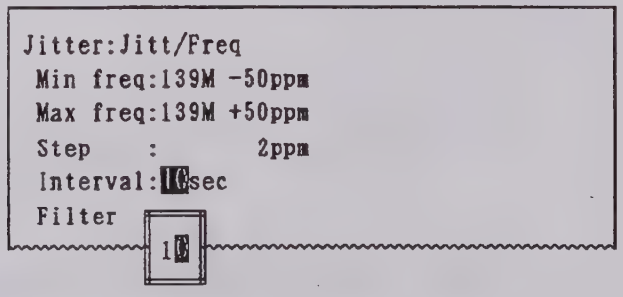


Fig. 5-153 Measurement Time Setting

(4) Filter setting:

Sets the filter for jitter amplitude measurement.

Setting ranges are as follows:

[Setting ranges]

OFF	:	No filter is used.
HP1	:	High-pass filter 1 is used.
HP2	:	High-pass filter 2 is used.
HP2 (N)	:	High-pass filter 2 (N) is used.
LP	:	Low-pass filter is used.
HP1 + LP	:	High-pass filter 1 and low-pass filter are used.
HP2 + LP	:	High-pass filter 2 and low-pass filter are used.
HP2 (N) + LP	:	High-pass filter 2 (N) and low-pass filter are used.

(N) is for the National interface and used only for 2M and 8M.

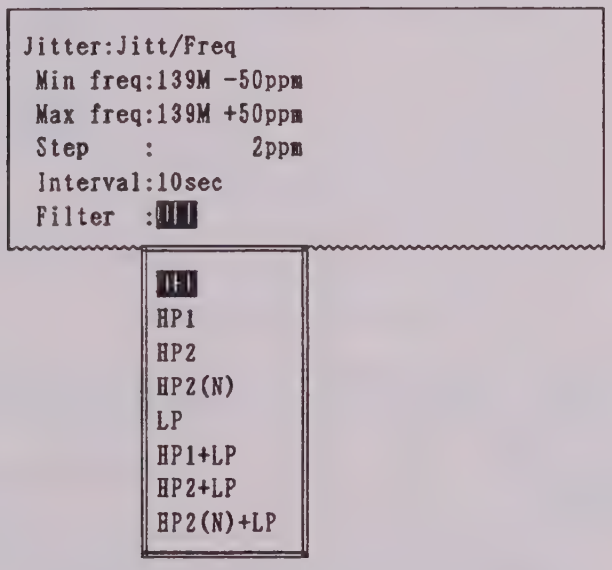


Fig. 5-154 Filter Setting

5.18.3 Display condition setting

Conduct settings for frequency-jitter amplitude characteristic display here.

[Settable items] The following item can be set:

- Scale setting

[Related item] The following item affects this setting:

- Bit rate

(1) Scale setting:

Sets the scale of vertical axis for jitter amplitude.

[Setting ranges] 2.0 UI_{p-p} : One graduation is set to 2.0 UI_{p-p}.
1.0 UI_{p-p} : One graduation is set to 1.0 UI_{p-p}.
0.2 UI_{p-p} : One graduation is set to 0.2 UI_{p-p}.
0.1 UI_{p-p} : One graduation is set to 0.1 UI_{p-p}.

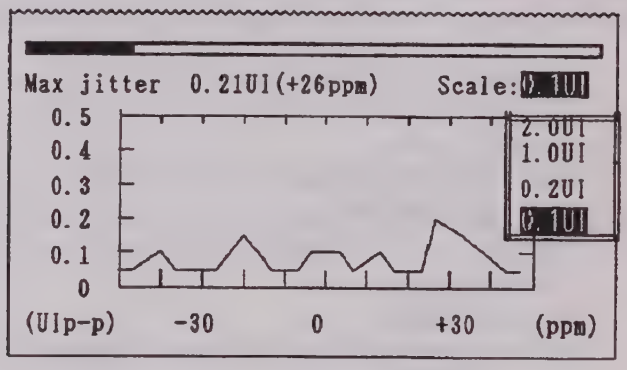


Fig. 5-155 Scale Setting

Pressing Start/Stop key initiates the measurement. Pressing the key again during measurement halts the measurement at that time according to the setting. Pressing the key a third time initiates the measurement from the beginning.

Measurement results are indicated as shown below. The maximum jitter amplitude and the bit rate (offset) at that time are indicated.

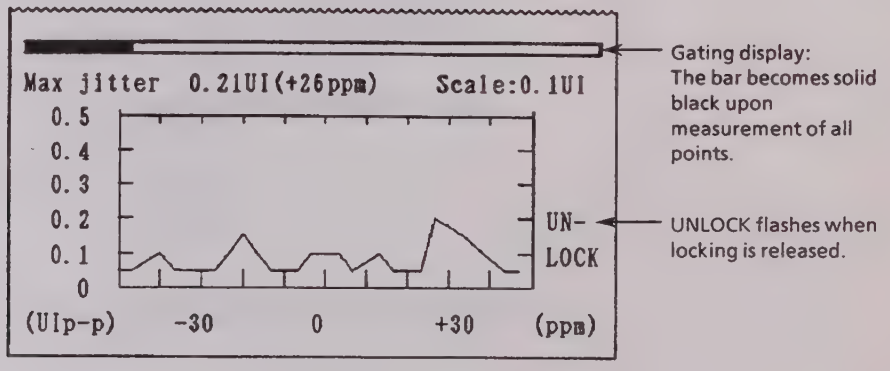


Fig. 5-156 Scale Setting

Note: *Even if the Start/stop key LED lights when the screen is changed to this screen during measurement at other screens, other measurement continues and the Jitter/Freq measurement is not executed. In this case, press the Start /Stop key once to stop measurement, and then press the same key again to start the Jitter/Freq measurement.*

SECTION 6
MEASUREMENT

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(Blank)

SECTION 6
MEASUREMENT

6.1 General

Paragraphs 6.2 to 6.7 give examples of the following main measurements performed by the MP1520B:

- Testing the Line (Loop-Back Measurement)
- Testing the Line (End-to-End Measurement)
- Testing the Multiplexer 1 (MUX/DEMUX Measurement)
- Testing the Multiplexer 2 (MUX Measurement)
- Testing the Multiplexer 3 (DEMUX Measurement)
- Monitoring the Line
- Measuring output jitter of the unit
- Measuring jitter tolerance of the unit
- Jitter Transfer measurement for the unit
- Measuring frequency-jitter characteristics of the unit

6.2 Testing the Line (Loop-Back Measurement)

(1) Settings: Settings are as follows:

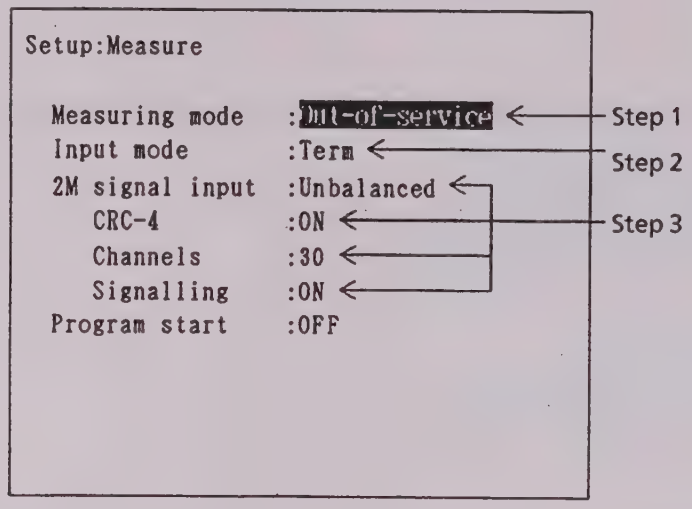


Fig. 6-1 Loop-Back Measurement Settings (Setup: Measure Screen)

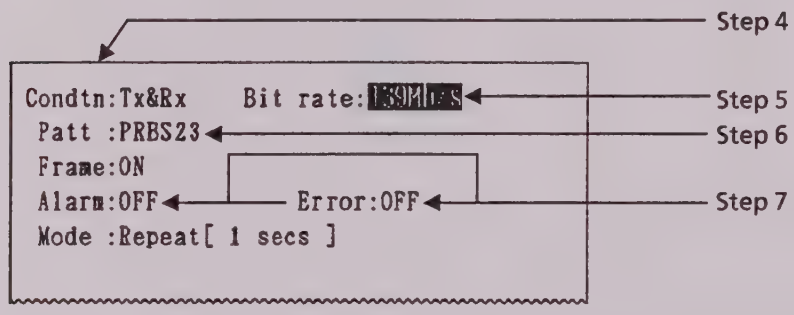


Fig. 6-2 Loop-Back Measurement Settings (Condtn Screen)

Step	Procedure
1	Set the Out-of-service state.
2	When connecting the line to the main output of the MP1520B, set Term. When connecting the line to an output whose level is attenuated by 20 dB, set Mon.
3	When measuring a 2 M signal, set the input terminal, CRC-4, Channels, and Signalling in accordance with the measurement object.
4	Set common settings to the transmitter and receiver sections (Tx&Rx).
5	Adjust the bit rate to the line speed.

Step	Procedure

6 Set Pattern. ITU-T specifies combinations of bit rates and patterns as follows:

Bit rate	Pattern
139 Mb/s	PRBS23
34 Mb/s	PRBS23
8 Mb/s	PRBS15
2 Mb/s	PRBS15

If the bit rate of this instrument is changed, the pattern is also changed automatically in accordance with the above table.

7 Set both Alarm insertion and Error insertion to OFF.

(2) Setup: Set the far-end equipment to Loop-Back after setting it

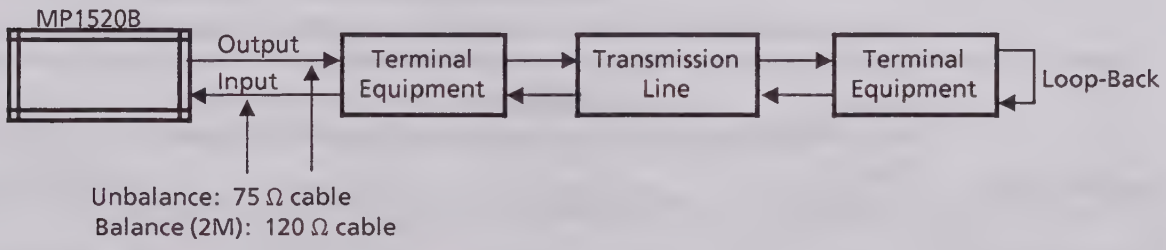


Fig. 6-3 Connection for Loop-Back Measurement Setup

(3) Measurement: Press the Start/Stop key to start a measurement

Check that all error and alarm LEDs are off.

Check the measured values on the Result screen. Set the error and measurement types on the Result screen.

Notes: • *When a signal other than a 2M signal is measured, the setting in (3) is not necessary.*

• *Only the above settings are required. Set the pattern, frame, measurement cycle, measurement type, and so forth in accordance with the test type.*

6.3 Testing the Line (End-to-End Measurement)

(1) Settings: Settings are as follows:

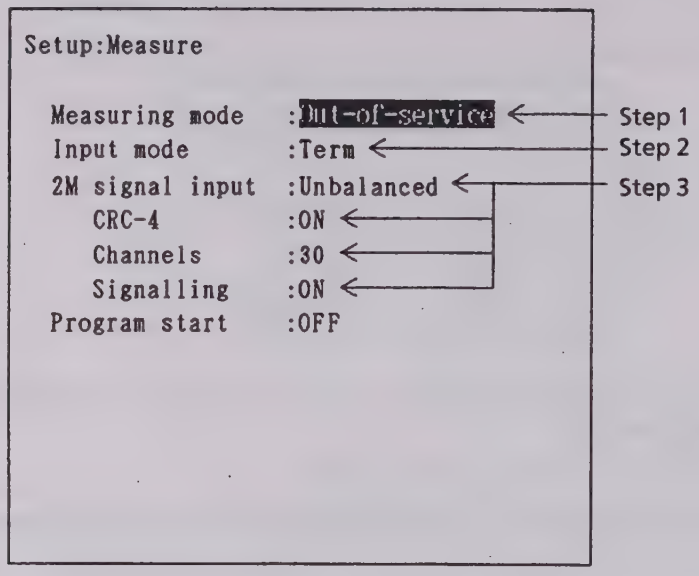


Fig. 6-4 Measurement Settings (Setup: Measure Screen)

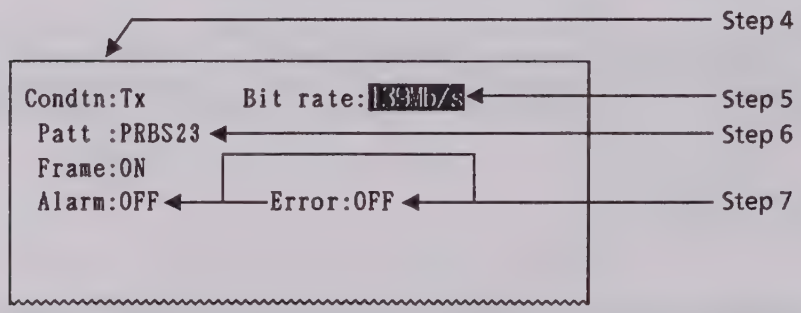


Fig. 6-5 Measurement Settings (Condtn Screen: Transmitter)

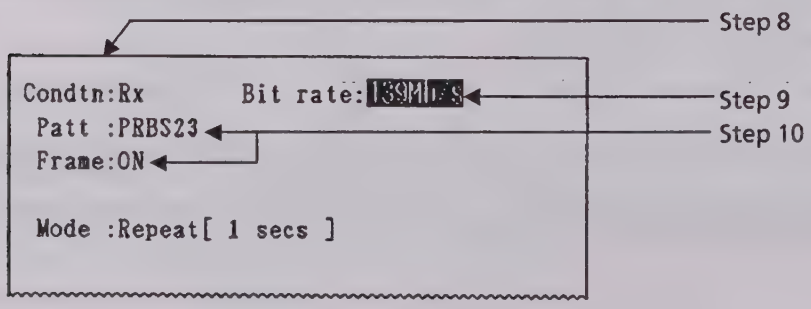


Fig. 6-6 Measurement Settings (Condtn Screen: Receiver)

Step	Procedure
1	Set the Out-of-service state (receiver).
2	When connecting the line to the main output of the MP1520B, set Term. When connecting the line to an output whose level is attenuated by 20 dB, set Mon.
3	When measuring a 2M signal, set the input terminal, CRC-4, Channels, and Signalling in accordance with the measurement object (for both transmitter and receiver).
4	Set the transmitter side to the transmitter section setting (Tx).
5	Adjust the bit rate of the transmitter side to the line speed.
6	Set Pattern. ITU-T specifies combinations of bit rates and patterns as follows:

Bit rate	Pattern
139 Mb/s	PRBS23
34 Mb/s	PRBS23
8 Mb/s	PRBS15
2 Mb/s	PRBS15

If the bit rate of this instrument is changed, the pattern is also changed automatically in accordance with the above table.

7	Set both Alarm insertion and Error insertion to OFF.
8	Set the receiver side to the receiver section setting (Rx).
9	Adjust the bit rate of the receiver to the line speed.
10	Adjust the pattern and frame of the receiver to those of the transmitter side.

(2) Setup: Connect the line and equipment as follows after setting it:

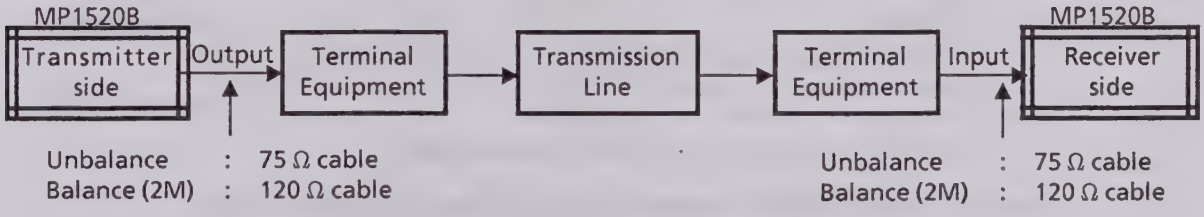


Fig. 6-7 Connection for Measurement Setup

(3) Measurement: Press the Start/Stop key to start a measurement

Check that all error and alarm LEDs are off.

Check the measured values on the Result screen. Set the error type, measurement type, and so forth on the Result screen.

Notes: • *When a signal other than a 2M signal is measured, the setting in (3) is not necessary.*

• *Only the above settings are required. Set the pattern, frame, measurement cycle, and so forth in accordance with the test type. If patterns and frames of the transmitter and receiver are set to different values, measurements cannot be performed correctly. Set the same values in both transmitter and receiver.*

6.4 Testing Multiplexer 1 (MUX/DEMUX Measurement)

(1) Settings: Settings are as follows:

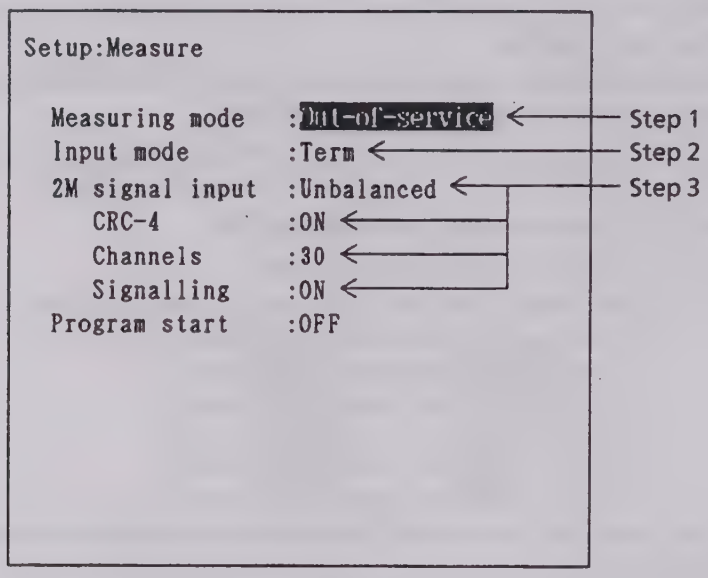


Fig. 6-8 MUX/DEMUX Measurement Settings (Setup: Measure Screen)

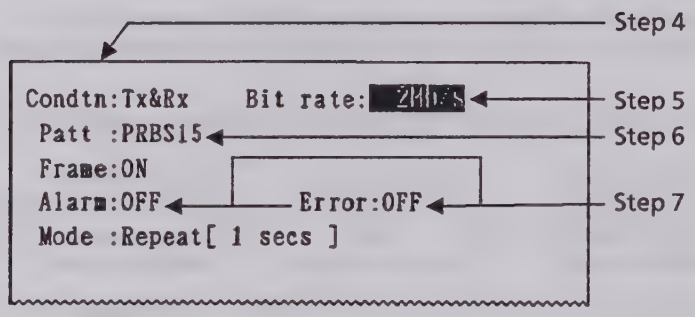


Fig. 6-9 MUX/DEMUX Measurement Settings (Condtn Screen)

Step	Procedure
1	Set the Out-of-service state.
2	When connecting the line to the main output of the MP1520B, set Term. When connecting the line to an output whose level is attenuated by 20 dB, set Mon.
3	When measuring a 2M signal, set the input terminal, CRC-4, Channels, and Signalling in accordance with the measurement object.
4	Set the common settings for the transmitter and receiver sections (Tx&Rx).
5	Adjust the bit rate to that of the MUX input.

Step	Procedure

6 Set the pattern to one of the values listed in the following table in accordance with the bit rate of the MUX input:

Bit rate	Pattern
139 Mb/s	PRBS23
34 Mb/s	PRBS23
8 Mb/s	PRBS15
2 Mb/s	PRBS15

7 Set both Alarm insertion and Error insertion to OFF.

(2) Setup: Connect the equipment as follows after setting it:

- Connect the MUX output to the DEMUX input.
- Connect DEMUX output #1 to MUX input #2, DEMUX output #2 to MUX input #3, and DEMUX output #3 to MUX input #4.
- Connect this instrument output to MUX input #1 and this instrument input to DEMUX output #4.

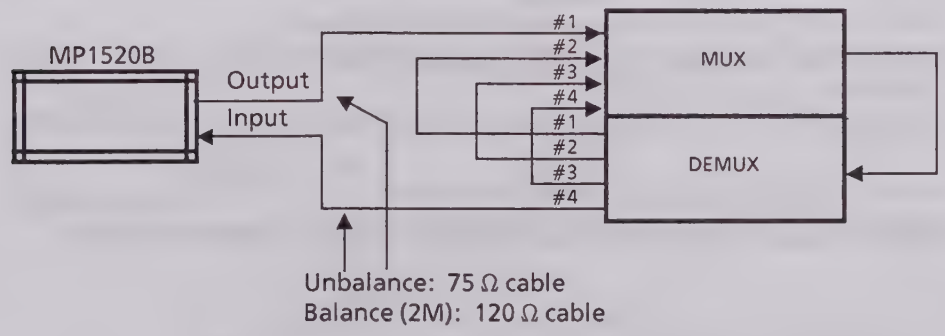


Fig. 6-10 Connection for MUX/DEMUX Measurement Setup

(3) Measurement: Press the Start/Stop key to start a measurement.

Check that all error and alarm LEDs are off.

Check the measured values on the Result screen. Set the error type, measurement type, and so forth on the Result screen.

Notes: • *When a signal other than a 2M signal is measured, the setting in (3) is not necessary.*

• *Only the above settings are required. Set the pattern, frame, measurement cycle, and so forth in accordance with the test type.*

6.5 Testing Multiplexer 2 (MUX Measurement)

(1) Settings: Settings are as follows:

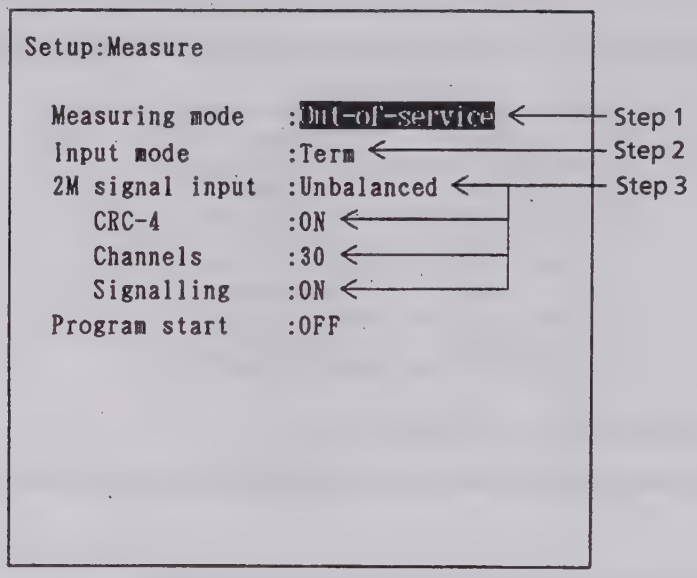


Fig. 6-11 MUX Measurement Settings (Setup: Measure Screen)

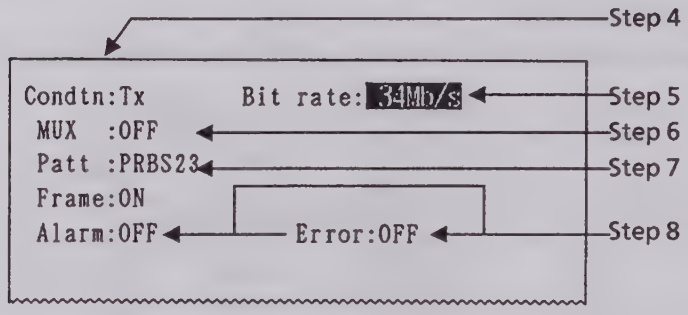


Fig. 6-12 MUX Measurement Settings (Condtn Screen: Transmitter side)

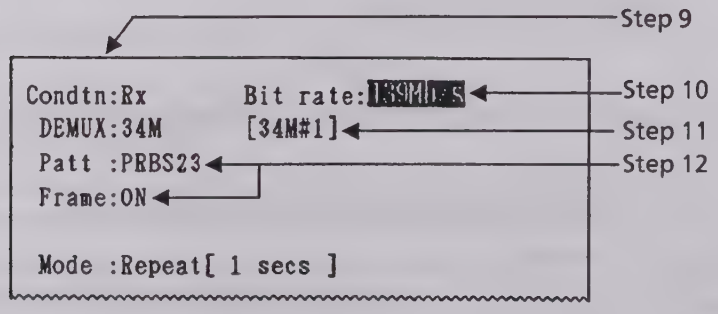


Fig. 6-13 MUX Measurement Settings (Condtn Screen: Receiver side)

Step	Procedure
1	Set the Out-of-service state (Receiver side).
2	When connecting the line to the main output of the MP1520B, set Term. When connecting the line to an output whose level is attenuated by 20 dB, set Mon.
3	When measuring a 2M signal, set the input terminal, CRC-4, Channels, and Signalling in accordance with the measurement object (for both transmitter and receiver).
4	Set the transmitter side to the transmitter section setting (Tx).
5	Adjust the bit rate of the transmitter to that of the MUX input.
6	Set the transmitter pattern to one of the values listed in the following table according to the bit rate of the MUX input.

Bit rate	Pattern
139 Mb/s	PRBS23
34 Mb/s	PRBS23
8 Mb/s	PRBS15
2 Mb/s	PRBS15

Step	Procedure
7	Set both Alarm insertion and Error insertion to OFF.
8	Set MUX of the transmitter to OFF.
9	Set the receiver to the receiver section setting (Rx).
10	Adjust the bit rate of the receiver to that of the MUX output.
11	Adjust the pattern and frame of the receiver to those of the transmitter.
12	Adjust DEMUX of the receiver to the bit rate and test channel of the MUX input.

(2) Setup: Connect the MP1520B and MUX as follows after setting them:

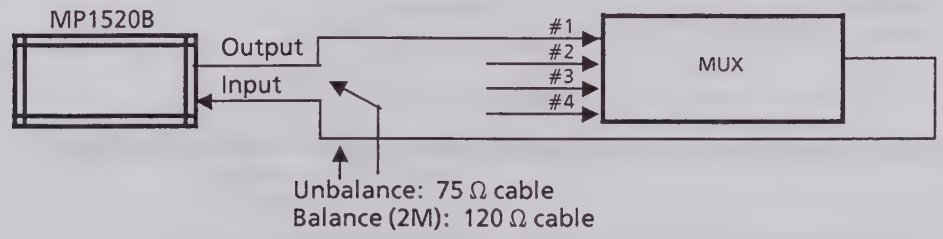


Fig. 6-14 Connection for MUX Measurement Setup

(3) Measurement: Press the Start/Stop key to start a measurement.

Check that all error and alarm LEDs are off.

Connect this instrument output to MUX input terminals #2, #3, and #4. Change channels of receiver DEMUX in accordance with the connections.

In both cases, check that all error and alarm LEDs are off.

Notes: • *When a signal other than a 2M signal is measured, the setting in (3) is not necessary.*

• *Only the above settings are required. Set the pattern, frame, measurement cycle, and so forth in accordance with the test type. If patterns and frames of the transmitter and receiver are set to different values, measurements cannot be performed correctly. Set the same values in both transmitter and receiver.*

• *This measurement can be performed when the MUX or DEMUX option is installed.*

6.6 Testing Multiplexer 3 (DEMUX Measurement)

(1) Settings: Settings are as follows:

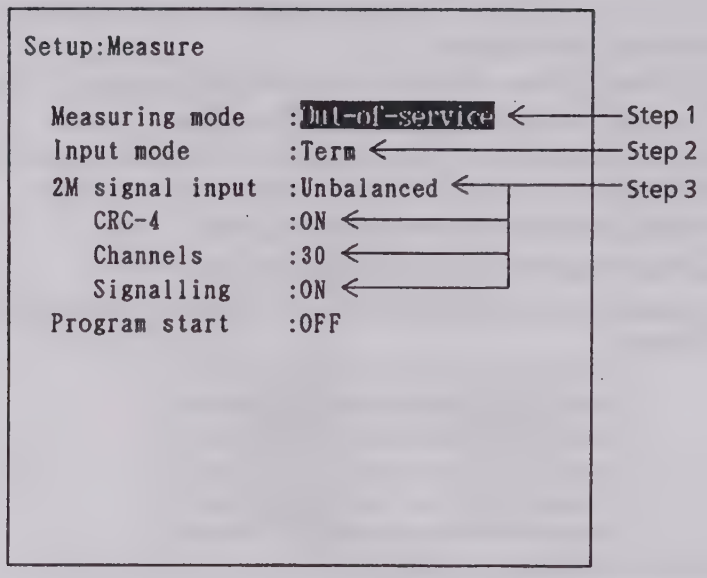


Fig. 6-15 DEMUX Measurement Settings (Setup: Measure Screen)

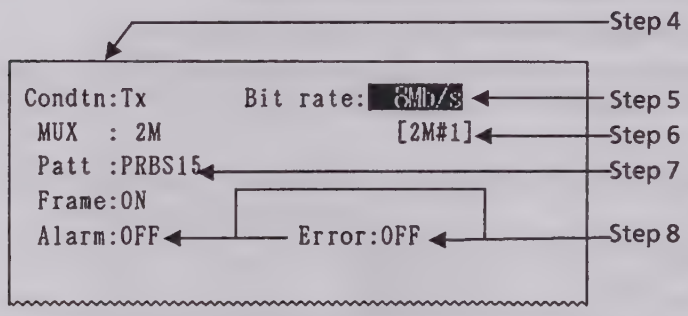


Fig. 6-16 DEMUX Measurement Settings (Condtn Screen: Transmitter side)

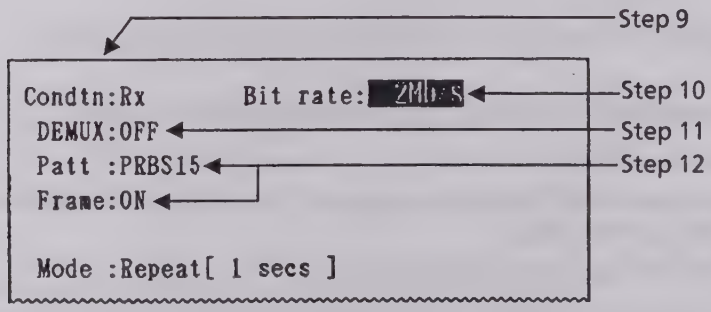


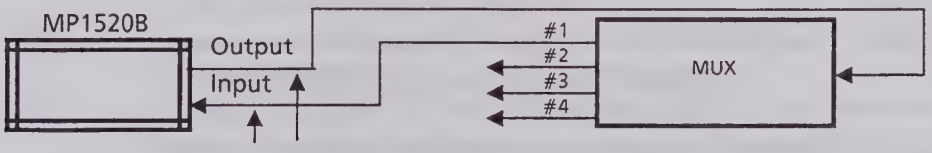
Fig. 6-17 DEMUX Measurement Settings (Condtn Screen: Receiver side)

Step	Procedure
1	Set the Out-of-service state (Receiver side).
2	When connecting the line to the main output of the MP1520B, set Term. When connecting the line to an output whose level is attenuated by 20 dB, set Mon.
3	When measuring a 2M signal, set the input terminal, CRC-4, Channels, and Signalling in accordance with the measurement object (for both transmitter and receiver).
4	Set the transmitter side to the transmitter section setting (Tx).
5	Adjust the bit rate of the receive signal to that of the DEMUX input.
6	Set the transmitter pattern to one of the values listed in the following table in accordance with the bit rate of the DEMUX output.

Bit rate	Pattern
139 Mb/s	PRBS23
34 Mb/s	PRBS23
8 Mb/s	PRBS15
2 Mb/s	PRBS15

Step	Procedure
7	Set both Alarm insertion and Error insertion to OFF.
8	Adjust transmitter MUX to the bit rate and test channel of the DEMUX output.
9	Set the receiver side to the receiver section setting (Rx).
10	Adjust the bit rate of the receiver to that of the DEMUX output.
11	Adjust the pattern and frame of the receiver to those of the transmitter.
12	Set DEMUX of the receiver to OFF.

(2) Setup: Connect the MP1520B and DEMUX as follows after setting them:



Unbalance: 75 Ω cable
Balance (2M): 120 Ω cable

Fig. 6-18 Connection for DEMUX Measurement Setup

(3) Measurement: Press the Start/Stop key to start a measurement.

Check that all error and alarm LEDs are off.

Connect this instrument input to DEMUX output terminals #2, #3, and #4. Change MUX channels of the transmitter in accordance with the connections.

In both cases, check that all error and alarm LEDs are off.

Notes: • *When a signal other than a 2M signal is measured, the setting in (3) is not necessary.*

- *Only the above settings are required. Set the pattern, frame, measurement cycle, and so forth in accordance with the test type. If patterns and frames of the transmitter and receiver are set to different values, measurements cannot be performed correctly. Set the same values in both transmitter and receiver.*
- *This measurement can be performed when the MUX or DEMUX option is installed.*

6.7 Monitoring the Line

(1) Settings: Settings are as follows:

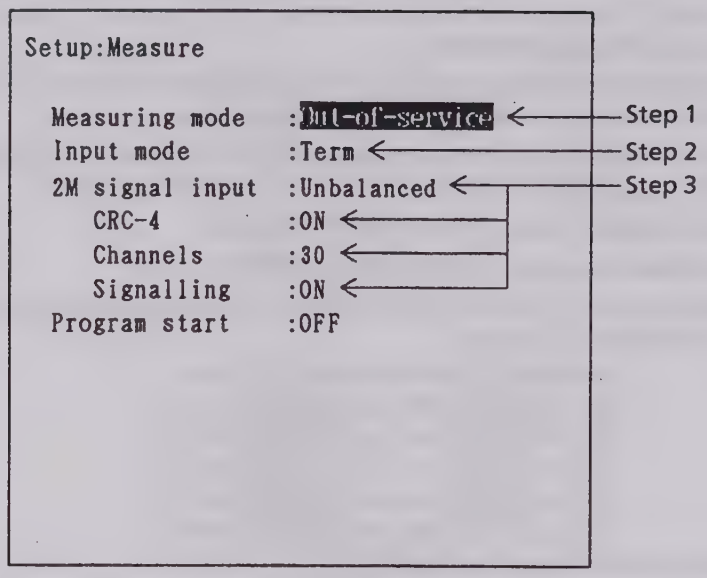


Fig. 6-19 Monitor Measurement Settings (Setup: Measure Screen)

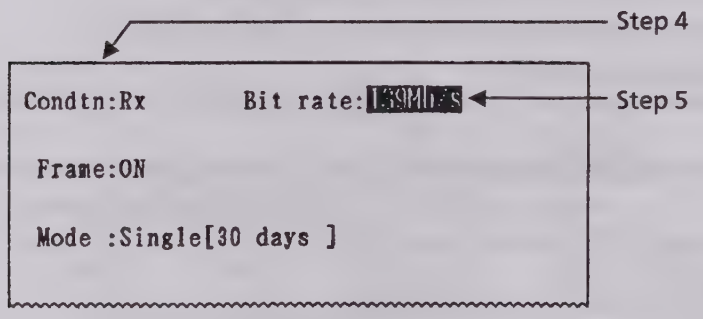


Fig. 6-20 Monitor Measurement Settings (Condtn Screen)

Step	Procedure
1	Set the In-service state.
2	When connecting the line to the main output of the MP1520B, set Term. When connecting the line to an output whose level is attenuated by 20 dB, set Mon.
3	When measuring a 2M signal, set the input terminal, CRC-4, Channels, and Signalling in accordance with the measurement object.
4	Set the receiver section setting (Rx).
5	Adjust the bit rate to the line speed.

(2) Setup: Use a monitor signal whose level is equal to that of the main signal, or is attenuated by 20 dB from the main signal

- Connect the MUX output to the DEMUX input.
- Connect DEMUX output #1 to MUX input #2, DEMUX output #2 to MUX input #3, and DEMUX output #3 to MUX input #4.
- Connect the MP1520B output to MUX input #1 and the MP1520B input to DEMUX output #4.

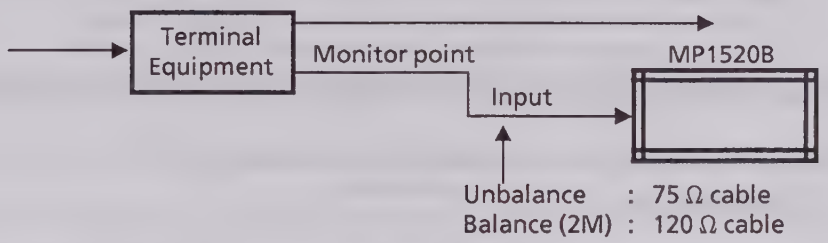


Fig. 6-21 Connection for Monitor Measurement Setup

(3) Measurement: Press the Start/Stop key to start a measurement

Use the history function of an error or alarm LED to check whether errors or alarms occur during the measurement.

An intermediate measured value (accumulated value) can be obtained by setting Dspl to Current on the Result screen. The progress of the measurement (measuring condition, error, and alarm) is stored in the MP1520B. See the Analysis:Trace Text Screen shown in paragraph 5.4.

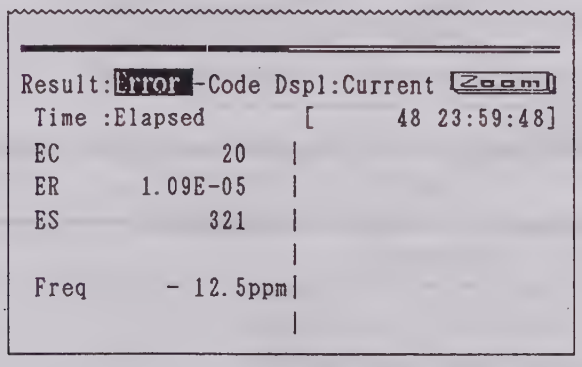


Fig. 6-22 Intermediate Measured Value (Accumulated Value) (Result Screen)

Notes: • *When a signal other than a 2M signal is measured, the setting in (3) is not necessary.*

• *Only the above settings are required. Set the performance, measurement type, measurement cycle, and so forth in accordance with the test type.*

6.8 Output Jitter Measurement

(1) Settings: Settings are as follows:

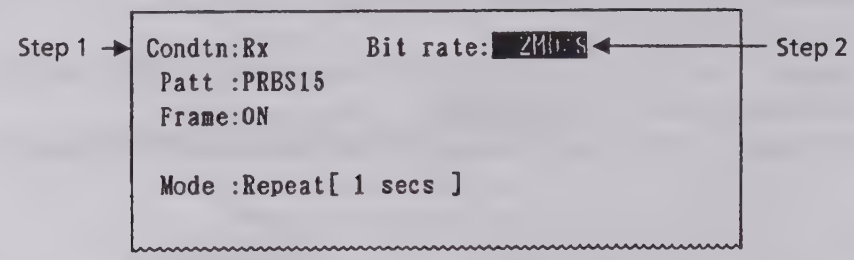


Fig. 6-23 Setting for Output Jitter Measurement (Condtn Screen)

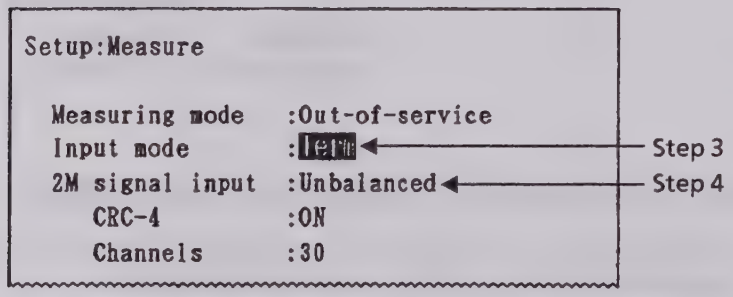


Fig. 6-24 Setting for Output Jitter Measurement (Setup Screen)

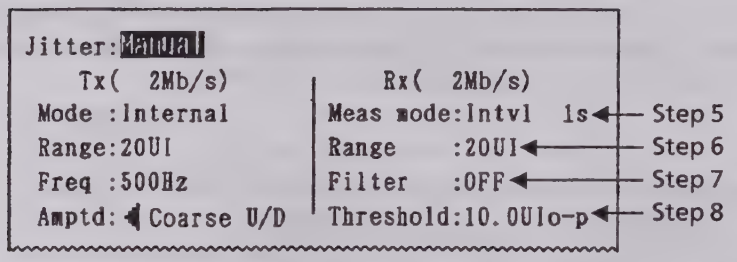


Fig. 6-25 Setting for Output Jitter Measurement (Jitter Screen)

Step	Procedure
1	Set Condtn to Rx.
2	Adjust the bit rate to the bit rate of output side of the unit.
3	Set input mode to Term.
4	When the bit rate is 2 M, select Balance or Unbalance.
5	Set the Meas mode to Intvl 1 s. Measurements are conducted every 1 sec. When measuring maximum jitter during 10 seconds, set the Meas mode to Intvl 10 s.
6	Set the Range to Auto. When the jitter value varies with possibility of exceeding 2 UI, set the Range to 20 UI.
7	Set the filter according to the specification of the unit.
8	Threshold may not be set, if not required. Number of jitters exceeding the positive and negative thresholds are counted.

When output jitter of a unit is measured with signals being supplied to the unit, conduct settings as explained below.

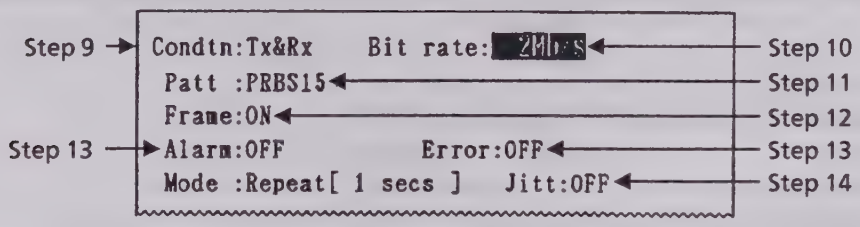


Fig. 6-26 Setting for Output Jitter Measurement (Condtn Screen)

Step	Procedure
9	Set Condtn to Tx&Rx.
10	Adjust the bit rate to the bit rate of output side of the unit. When the bit rate is 2 M, select Balance or Unbalance on the screen shown in Fig. 6-24.
11	Set Patt according to the bit rate as shown below. 2 M, 8 Mb/s:PRBS15 34 M, 139 Mb/s:PRBS23
12	Set Frame to ON or OFF according to the unit specification.
13	Set Alarm and Error to OFF.
14	Set Jitt to OFF.

(2) Setup: Connect the MP1520B and Output Jitter as follows after setting them:

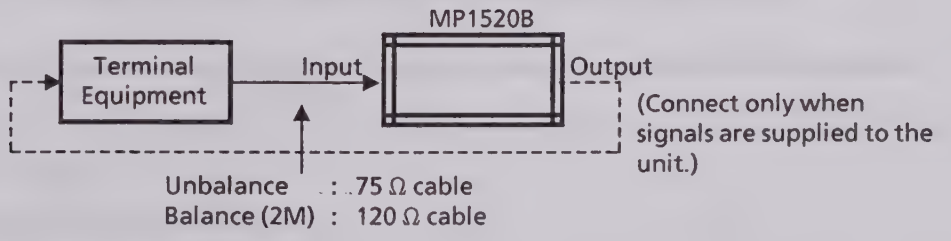


Fig. 6-27 Connection for Output Jitter Measurement

(3) Measurement: When Dspl is set to Last, indication is renewed at intervals of the time set in step 5.

When Dspl is set to Current, the maximum value within the time in step 5 is renewed every 0.2 seconds.

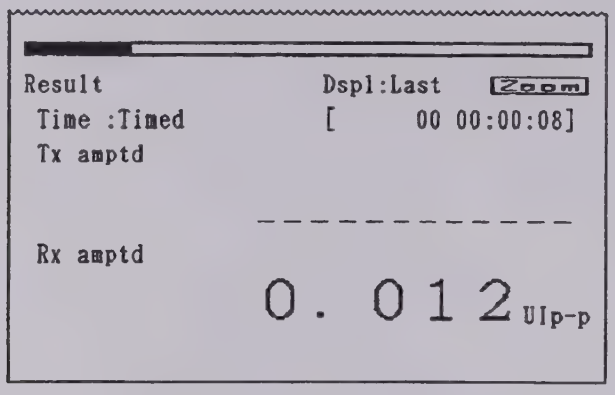


Fig. 6-28 Output Jitter Measurement Display

Notes: • *Settings not specified herein do not affect measurements.*

• *Set Mux or Demux to OFF when the Mux/Demux option is installed.*

6.9 Jitter Tolerance Measurement

(1) Settings: Settings are as follows:

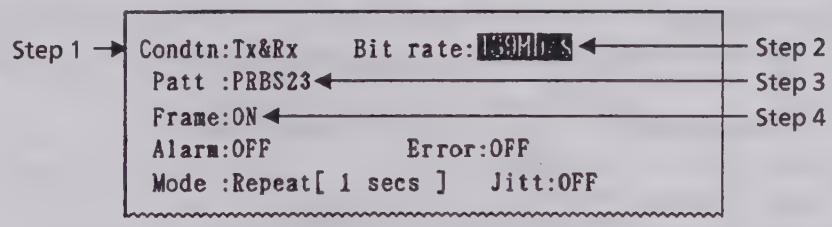


Fig. 6-29 Setting for Jitter Tolerance Measurement (Condtn Screen)

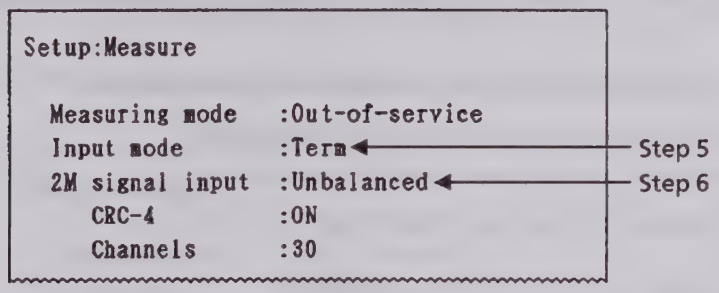


Fig. 6-30 Setting for Jitter Tolerance Measurement (Setup Screen)

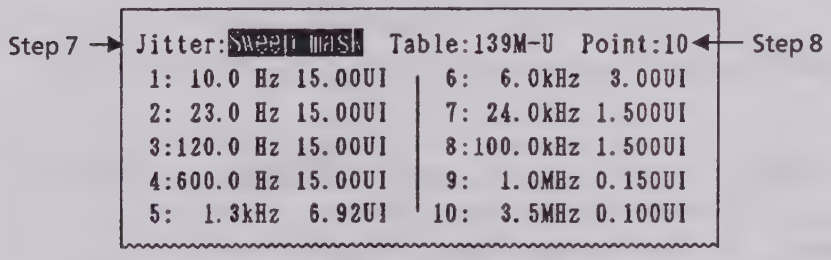


Fig. 6-31 Setting for Jitter Tolerance Measurement (Jitter Screen)

Step	Procedure
1	Set Condtn to Tx&Rx.
2	Adjust the bit rate to the bit rate of the unit.
3	Set Patt according to the bit rate as shown below. 2 M, 8 Mb/s:PRBS15 34 M, 139 Mb/s:PRBS3
4	Set Frame to ON or OFF according to the unit specification.
5	Set the input mode to Term.
6	When the bit rate is 2 M, select Balance or Unbalance.
7	Set Jitter to Sweep mask.
8	Set the table, referring to 5.16.2, Sweep mask table setting.

(2) Setup: Connect the MP1520B and Jitter as follows after setting them:

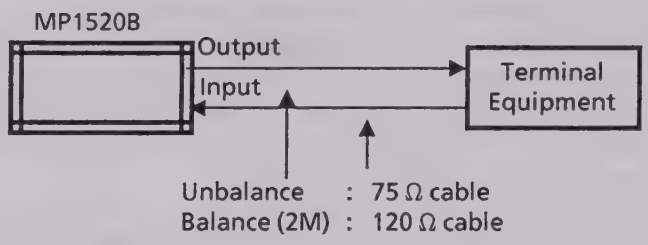


Fig. 6-32 Connection for Jitter Tolerance Measurement

(3) Measurement: Press Start/Stop key to initiate measurement.

Pressing the key during measurement again halts the measurement.

Pressing the key a third time initiates measurement from the beginning.

Typical indication of measurement results is shown below.

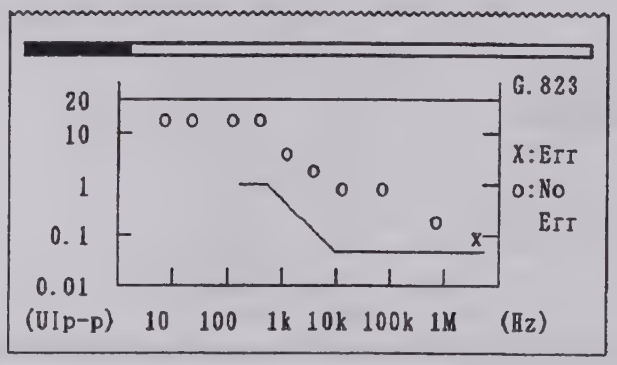


Fig. 6-33 Jitter Tolerance Measurement Display

Notes:
- *Settings other than above are set appropriately and automatically. (Setting alarm and error to OFF, etc.)*
- *When the frequency offset option is installed, the frequency offset is automatically set to 0 ppm upon start of measurement.*
- *When the Mux/Demux option is installed, the Mux and Demux are automatically set to OFF upon start of measurement.*
- *When measurement is complete or halted, the above settings return to the original ones before measurement was initiated.*

6.10 Jitter Transfer Measurement

6.10.1 Calibration

Conduct the calibration in the first place, in order to ensure accurate measurements.

(1) Settings: Settings are as follows:

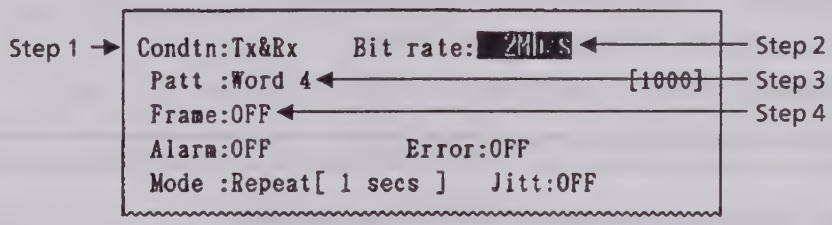


Fig. 6-34 Settings for Jitter Transfer Measurement (Condtn screen)

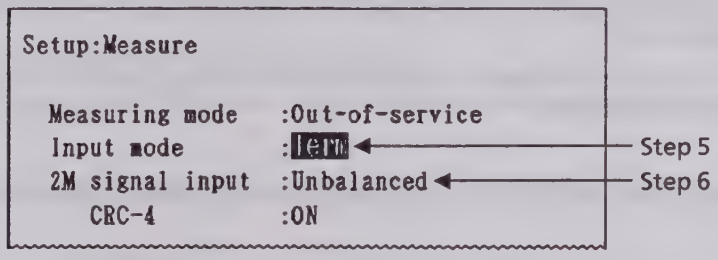


Fig. 6-35 Settings for Jitter Transfer Measurement (Setup Screen)

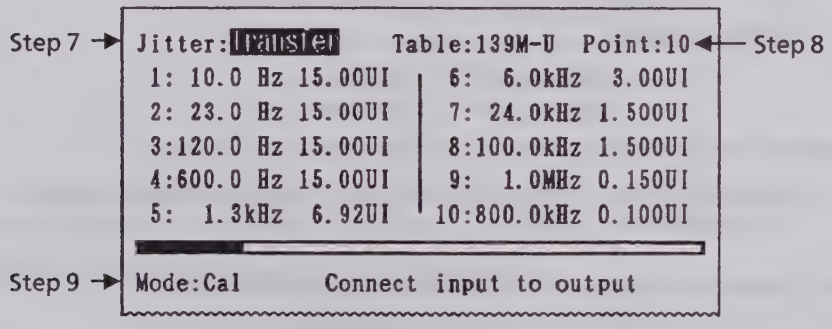


Fig. 6-36 Settings for Jitter Transfer Measurement (Jitter Screen)

Step	Procedure
1	Set Condtn to Tx&Rx.
2	Adjust the bit rate to the bit rate of the unit.
3	Set the Patt according to the unit. The ITU-T G.742 (2 M/8 M Mux) and G751 (8 M/34 M, 34 M/139 M Mux) recommend the 1000 repetition pattern.
4	Set Frame to ON or OFF according to the unit specification.

Step	Procedure
5	Set the input mode to Term.
6	When the bit rate is 2 M, select Balance or Unbalance.
7	Set Jitter to Transfer.
8	Set the table, referring to 5.17.2, Transfer table setting.
9	Set the Mode to Cal.

Notes:
- *Settings other than above are set appropriately and automatically.*
- *When the frequency offset option is installed, the frequency offset is automatically set to 0 ppm upon start of measurement.*
- *When the Mux/Demux option is installed, the Mux and Demux are automatically set to OFF upon start of measurement.*
- *When measurement is complete or halted, the above settings return to the original ones before measurement was initiated.*

(2) Setup: Connect the MP1520B and Jitter as follows after setting them:

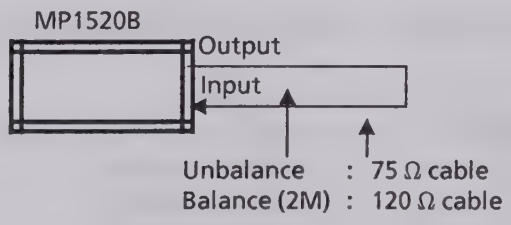


Fig. 6-37 Connection for Calibration for Jitter Transfer Measurement

(3) Measurement: Press Start/Stop key to initiate measurement.

When the cable is not connected, a "Connect input to output" message flashes.

6.10.2 Transfer measurement

(1) Settings: Settings are as follows:

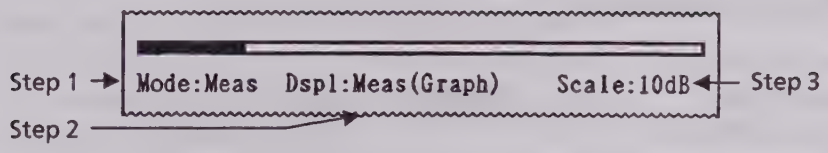


Fig. 6-38 Setting for Jitter Transfer Measurement (Jitter screen)

Step	Procedure
1	Set the Mode to Meas.
2	Select Meas (Graph) to indicate measurement results by a graph or Meas (Table) to indicate them by numerals. When Cal (Table) is selected, calibration values are indicated.
3	When Dspl is set to Meas (Graph), set the scale.

(2) Setup: Connect the MP1520B and Jitter as follows after setting them:

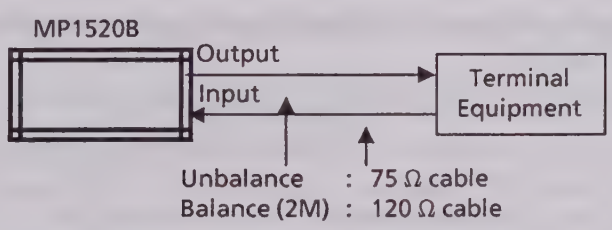
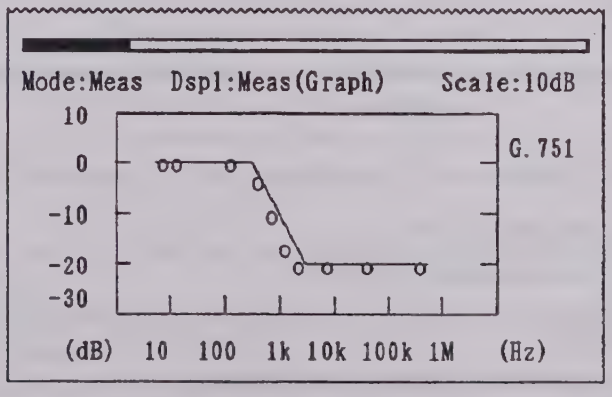


Fig. 6-39 Connection for Jitter Transfer Measurement

(3) Measurement: Press Start/Stop key to initiate measurement.

Typical indication of measurement results is shown below.



Note : When an abnormal value is measured (such as 0 jitter amplitude of the transmitter, a jitter amplitude exceeding the specified range at the receiver, etc.), a cross mark is indicated.

Fig. 6-40 Jitter Transfer Measurement Display

6.11 Frequency-Jitter Amplitude Characteristic Measurement

This measurement can be conducted only when the frequency offset option is installed.

(1) Settings: Settings are as follows:

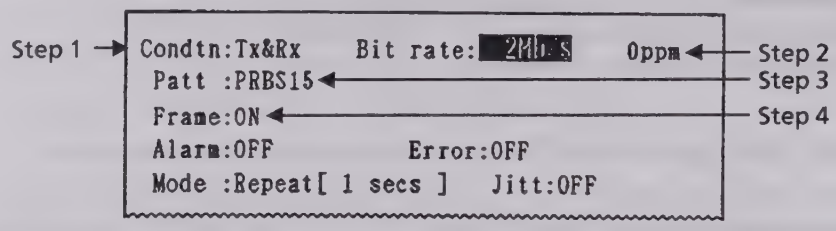


Fig. 6-41 Settings for Frequency-Jitter Amplitude Characteristic Measurement (Condtn Screen)

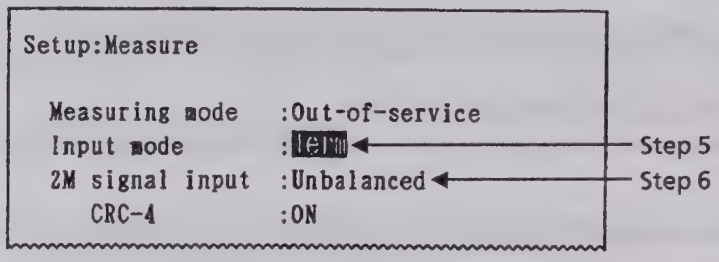


Fig. 6-42 Settings for Frequency-Jitter Amplitude Characteristic Measurement (Setup Screen)

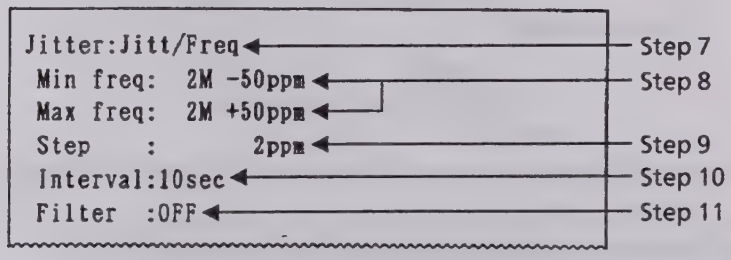


Fig. 6-43 Settings for Frequency-Jitter Amplitude Characteristic Measurement (Jitter Screen)

Step	Procedure
1	Set Condtn to Tx&Rx.
2	Adjust the bit rate to the bit rate of the unit.
3	Set Patt according to the bit rate as shown below. 2 M, 8 Mb/s:PRBS15 34 M, 139 Mb/s:PRBS23
4	Set Frame to ON or OFF according to the unit specification.
5	Set the input mode to Term.

Step	Procedure
6	When the bit rate is 2 M, select Balance or Unbalance.
7	Set Jitter to Jitt/Freq.
8	Set the minimum and maximum frequencies.
9	Set the frequency variable step.
10	Set the jitter measurement time.
11	Set the filter according to the unit specification.

(2) Setup: Connect the MP1520B and Jitter as follows after setting them:

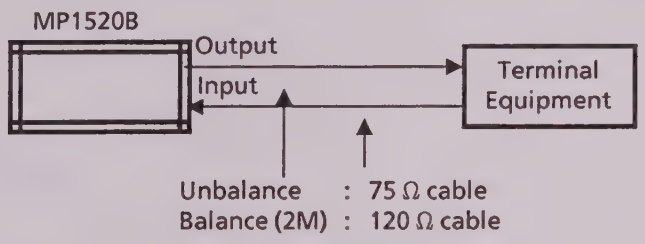


Fig. 6-44 Connection for Frequency-Jitter Amplitude Characteristic Measurement

(3) Measurement: Press Start/Stop key to initiate measurement.

Typical indication of measurement results is shown below.

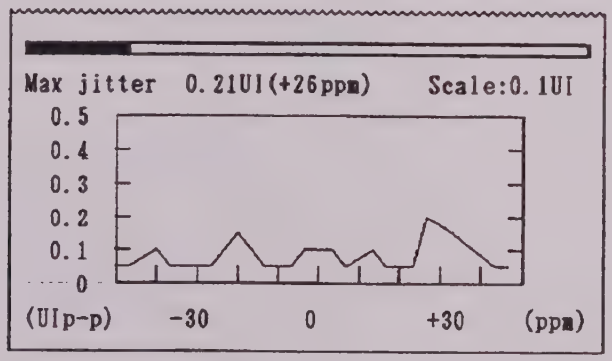


Fig. 6-45 Frequency-Jitter Amplitude Characteristic Measurement Display

Notes:
- *Settings other than above are set appropriately and automatically. (Setting alarm and error to OFF, etc.)*
- *When the Mux/Demux option is installed, the Mux and Demux are automatically set to OFF upon start of measurement.*
- *When measurement is complete or halted, the above settings return to the original ones before measurement was initiated.*

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SECTION 7
PERFORMANCE TESTS

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SECTION 7
PERFORMANCE TESTS

7.1 General Description

This section describes how to perform the MP1520B performance tests and how to evaluate their results.

The performance tests may be performed for acceptance inspections, checks after repair or adjustment, or periodic calibration.

Execute the performance tests at regular intervals as preventive maintenance for important evaluation items. We recommend that performance tests be performed regularly once or twice a year.

If these performance tests do not meet your requirements, please let us know.

It is necessary to contact Anritsu Corporation to ask for repair to the machine, please give us the following information:

(a) Model name and serial number marked on the rear panel;

(b) A description of the fault;

(c) Name of a personnel-in-charge and address for contact when fault confirmed or at a completion of repair

7.2 Equipment Required

Table 7-1 Equipment Required

Equipment	Recommended model name	Required performance	Test item paragraph No.
Frequency Counter	MF57A	Frequency range: 1 to 200 MHz	7.4.1
Oscilloscope	———	Frequency range: dc to 500 MHz	7.4.2 to 7.4.5 7.4.12, 7.4.14
75 Ω /50 Ω Matching Pad	MP548A	Frequency range: dc to 200 MHz Voltage conversion ratio: Voltage from 50 Ω side/Voltage from 75 Ω side = 1/10	7.4.1 to 7.4.5 7.4.12, 7.4.14
75 Ω/120 Ω Impedance Transformer	MP35A	Frequency range: 2 Mb/s	7.4.2, 7.4.6
Resistance Attenuator	———	Frequency range: dc to 500 MHz Impedance: 75 Ω	7.4.6 to 7.4.8
Coaxial cable	———	Cable with 6 dB loss at 1.0 MHz Cable with 6 dB loss at 4.2 MHz Cable with 12 dB loss at 17 MHz Cable with 12 dB loss at 70 MHz	7.4.6 to 7.4.8
Signal generator	———	Frequency range: 10 Hz to 150 MHz Impedance: 75 Ω	7.4.12, 7.4.13
Jitter measuring unit	ME520B receiver	Bit rate: 2 M, 8 M, 34 M, 139 Mb/s Jitter quantity: 10 UI_{P-P}	7.4.13
Jitter signal generator	ME520B transmitter	Bit rate: 2 M, 8 M, 34 M, 139 Mb/s Code: HDB3, CMI Jitter quantity: 10 UI_{P-P}	7.4.14

7.3 Preparations

Before executing the performance tests described on the following pages, unless otherwise specified in the test procedure, the instrument under test and all other measuring instruments must be warmed for at least 30 minutes so the test is executed under stable conditions. To measure at the highest accuracy, the tests must be performed at room temperature, ac power-supply voltage fluctuations must be minimized, and there must be no problem with noise, vibrations, dust, or humidity.

7.3.1 Panel settings

The panel settings shown for the performance tests described on the following pages only show the differences from the state under which this instrument is initialized. Initialize the MP1520B panel setting parameters before executing the performance tests. To test each item successively, any panel settings changed after a test item completed should be returned to the original initial settings before the next test item is executed.

[Initial setting procedure]

- Press the Memory key.
- Move the cursor to 0.Initial.
- Press the Set key.

7.3.2 Function check

Most of the functions provided for this instrument can be checked by selftest. For how to execute the selftest procedure and check the results, see paragraph 5.11, "Setting the Selftest Screen".

7.4 Performance Tests

7.4.1 Transmit signal bit rate

(1) Test specifications

- Bit rates 2.048 Mb/s
  8.448 Mb/s
  34.368 Mb/s
  139.264 Mb/s
- Accuracy ±10 ppm
- Variable range when frequency offset (Option 01) is incorporated: Above frequencies ±100 ppm in 1 ppm steps

(2) Setup

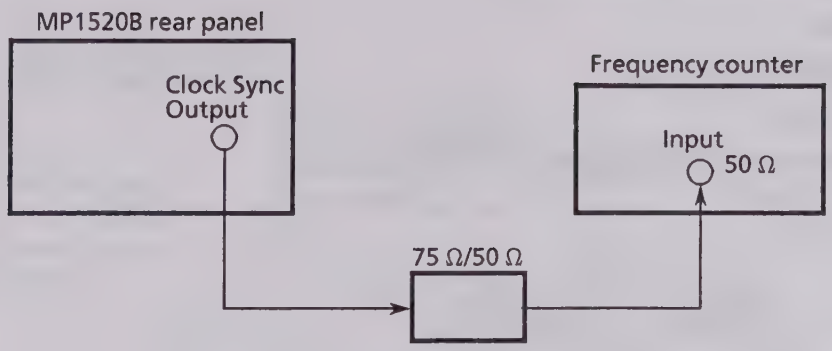


Fig. 7-1 Transmit Signal Bit Rate Test

(3) Test procedure

Step	Procedure
1	Connect the MP1520B as shown in Fig.7-1
2	Set the bit rate to 2 Mb/s on the Condtn screen.

```
Condtn:[X&R]     Bit rate:139Mb/s
 Patt :Word16       [1111 0000 1010 0101]
 Frame:ON
 Alarm:AIS139M      Error:Code   Sgl
 Mode :Repeat[99 hours]
```

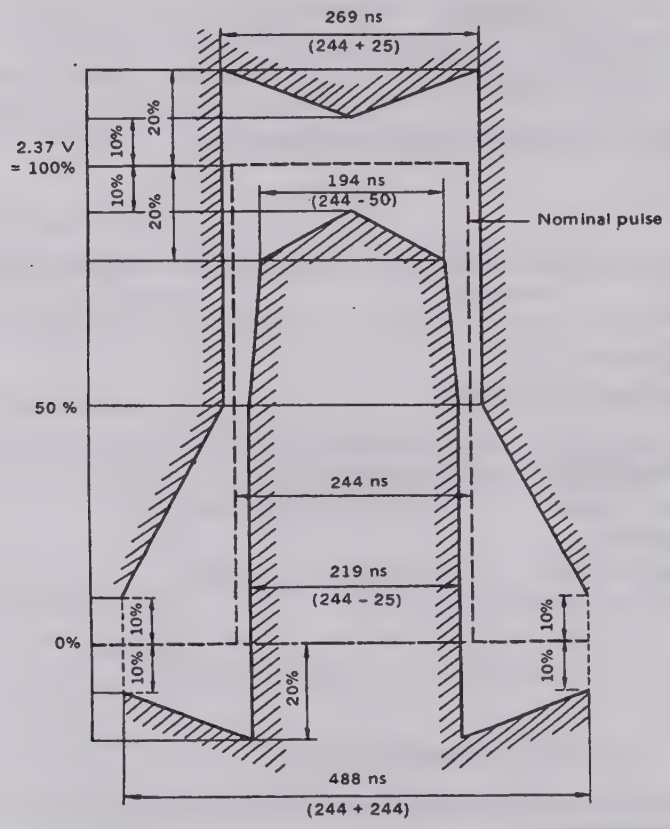
Fig. 7-2 Condtn Screen

3	Measure the clock frequency with the frequency counter, then check that its value is within the nominal bit rate value given in (1).
4	Set the bit rate to 8 Mb/s, 34 Mb/s, and 139 Mb/s in turn. Using the frequency counter, check that its value is within the specifications listed in (1)
5	When the frequency offset (Option 01) is incorporated, change the frequency by ±100 ppm and perform the same measurement.

7.4.2 Bipolar output waveform (Balanced)

(1) Test specifications

- Frequency 2.048 Mb/s
- Level $3 \pm 0.3\ V_{0\text{-}P}$
- Pulse shape Meets the specifications shown in Fig.7-3.



+Ve pulse mask and
-Ve pulse mask are
symmetrical about
GND electric potential
(0 V)

Fig.7-3 2 M Pulse Mask

(2) Setup

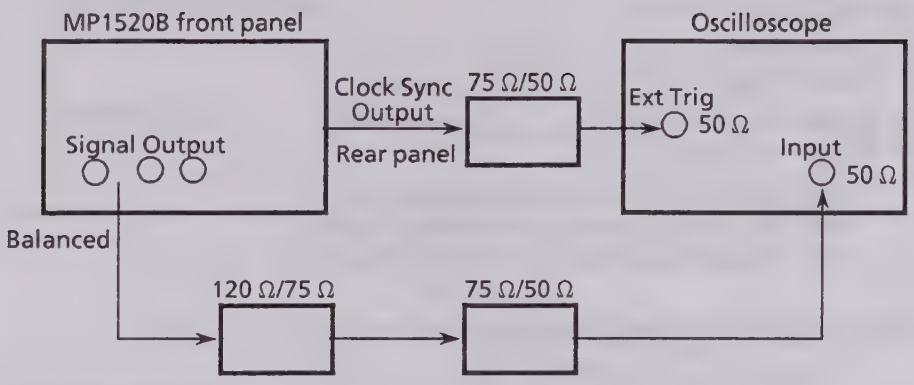


Fig. 7-4 Bipolar Output Waveform Test (Balanced)

(3) Test procedure

Step	Procedure
1	Connect the MP1520B as shown in Fig.7-4.
2	Set the bit rate to 2 Mb/s on the Condtn screen.
3	Check that the pulse shape is within the pulse mask shown in Fig. 7-3. (The nominal output level after 120 Ω/75 Ω impedance transforming becomes 2.37 Vo-p.)

7.4.3 Bipolar output waveform (Unbalanced)

(1) Test specifications

- Frequency 2.048 Mb/s
  8.448 Mb/s
  34.368 Mb/s
- Level 2.37 ±0.237 $V_{0\text{-}P}$ (2 M, 8 M)
  1 ±0.1 $V_{0\text{-}P}$ (34 M)
- Pulse shape 2 M: Meets the specifications shown in Fig.7-3.
  8 M: Meets the specifications shown in Fig.7-5.
  34 M: Meets the specifications shown in Fig.7-6.

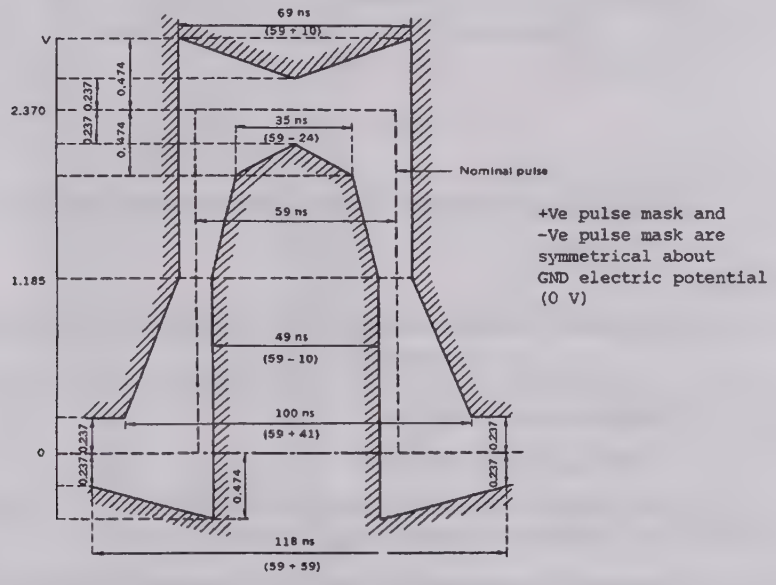


Fig.7-5 8 M Pulse Mask

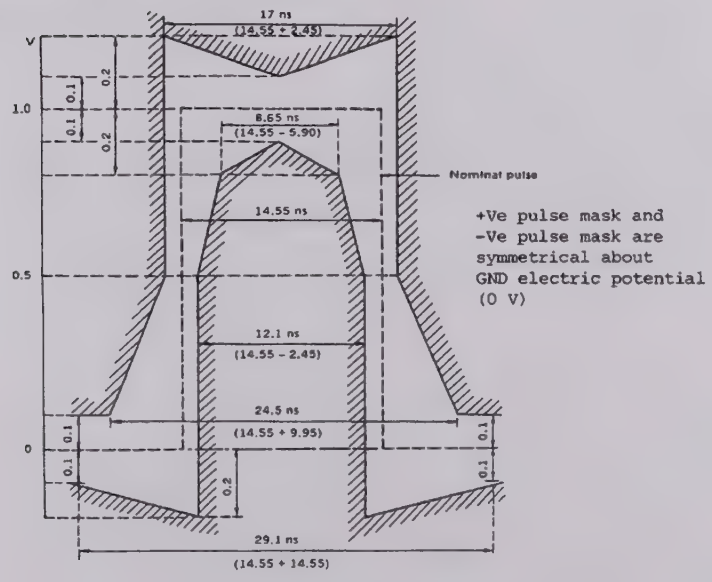


Fig. 7-6 34 M Pulse Mask

(2) Setup

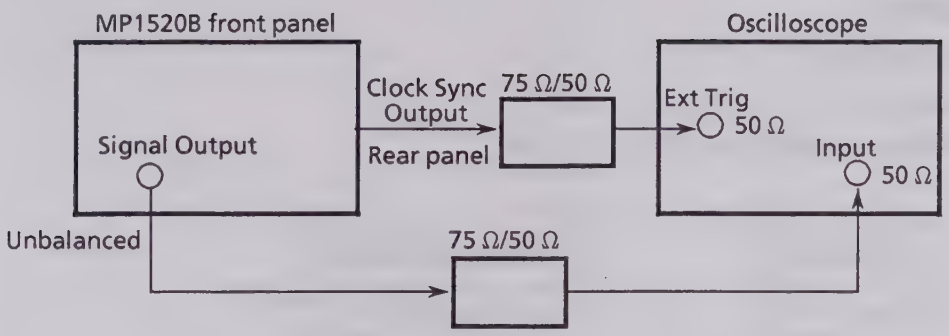


Fig. 7-7 Bipolar Output Waveform Test (Unbalanced)

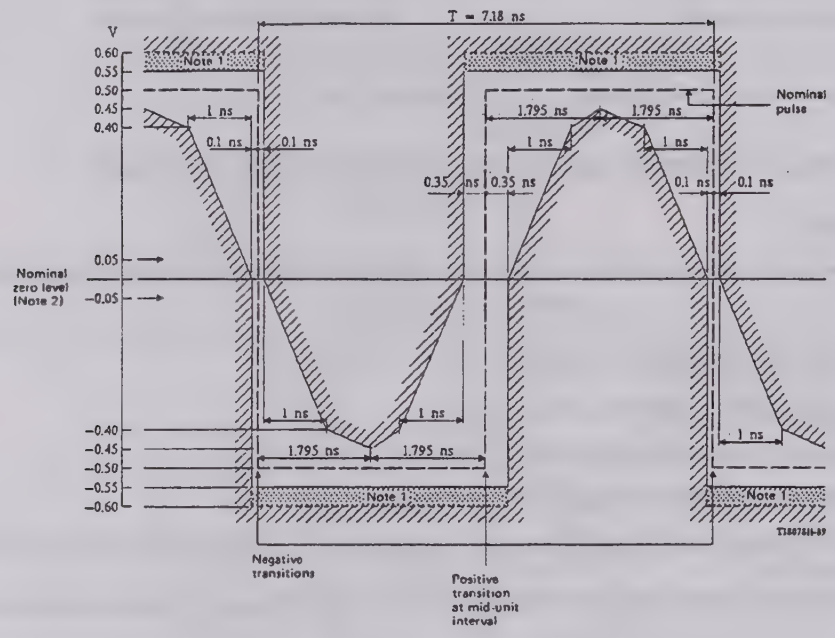
(3) Test procedure

Step	Procedure
1	Connect the MP1520B as shown in Fig.7-7.
2	Set the bit rate to 2 Mb/s on the Condtn screen.
3	Check that the pulse shape is within the pulse mask shown in Fig.7-3.
4	Set the bit rate sequentially through 8 Mb/s, 34 Mb/s. Using the oscilloscope, check that respective pulse shapes exist within the pulse masks shown in Figs.7-5 and 7-6.

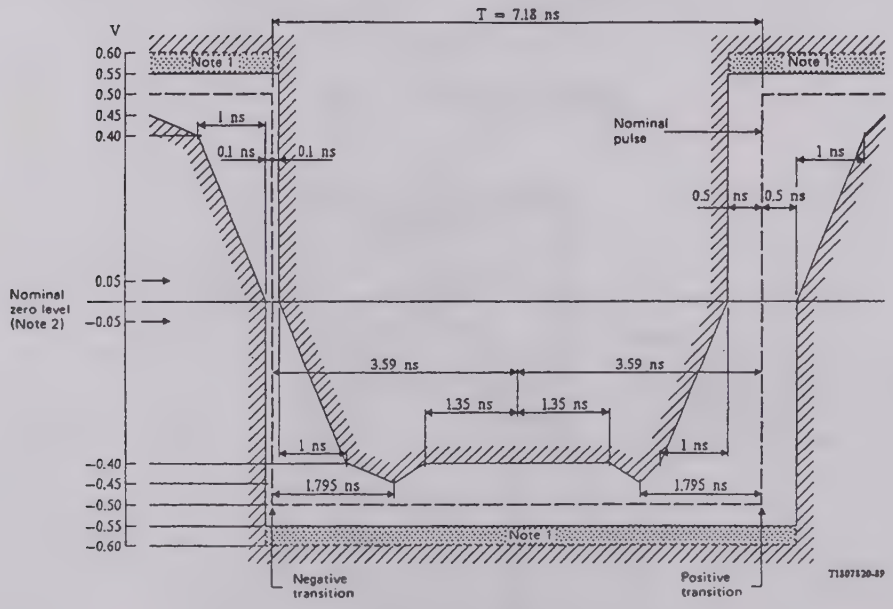
7.4.4 CMI output waveform

(1) Test specifications

- Frequency 139.264 Mb/s
- Level $1 \pm 0.1\ V_{P\text{-}P}$
- Pulse shape Meets the specifications shown in Fig.7-8.



binary 0



binary 1

Fig.7-8 139 M Pulse Mask

(2) Setup

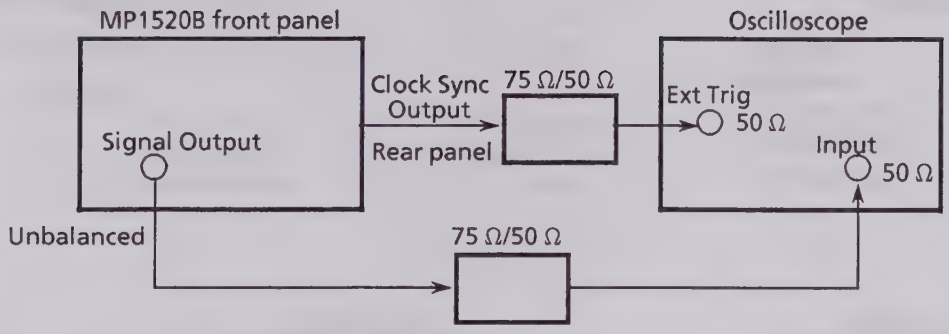


Fig.7-9 CMI Output Waveform Test

(3) Test procedure

Step	Procedure
1	Connect the MP1520B as shown in Fig.7-9.
2	Set the bit rate to 139 Mb/s on the Condtn screen.
3	Check that the pulse shape is within the pulse mask shown in Fig.7-8.

7.4.5 Clock sync output

(1) Test specifications

- Frequency: 2.048 Mb/s, 8.448 Mb/s, 34.368 Mb/s, 139.264 Mb/s
- Level: 0.5 ±0.1 V_{p-p}

(2) Setup

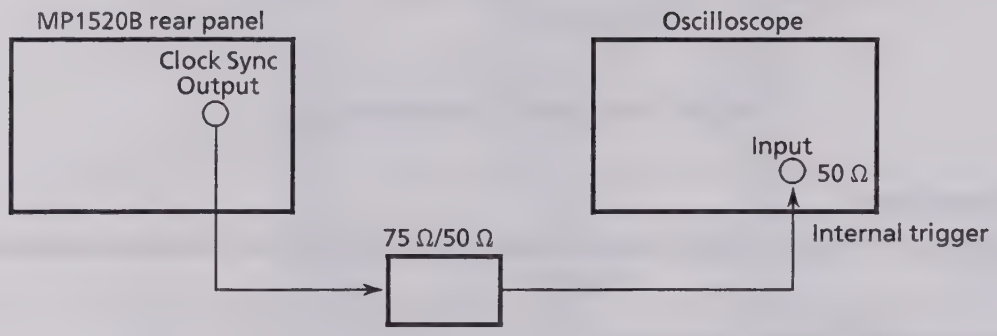


Fig.7-10 Clock Sync Output Test

(3) Test procedure

Step	Procedure
1	Connect the MP1520B as shown in Fig.7-10.
2	Set the bit rate to 2 Mb/s on the Condtn screen.
3	Check that the level is within 0.5 ±0.1 V_{p-p}.
4	Set the bit rate to 8.448 Mb/s, 34.368 Mb/s, and 139.26 Mb/s in turn, and check that its level is within the specifications.

7.4.6 Bipolar input level (Balanced)

(1) Test specifications

- Frequency 2.048 Mb/s
- Input level

Nominal value	3 ±0.3 V_{O-P}
Cable loss	0 to 6 dB (at 1 MHz)
Addition gain	20 dB

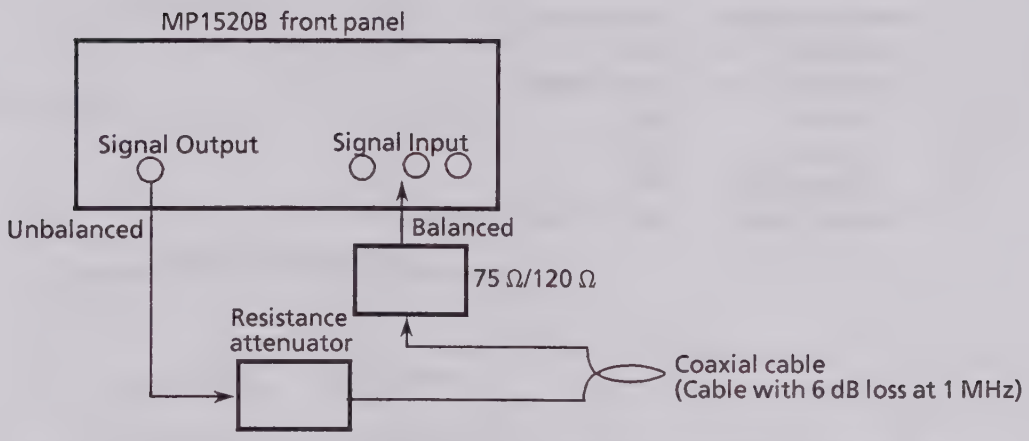


Fig. 7-11 Bipolar Input Level Test (Balance)

(2) Test procedure

Step	Procedure

1 Connect the MP1520B as shown in Fig.7-11.

2 Set the bit rate to 2 Mb/s on the Condtn screen.

3 On the Setup:Measure screen, set the Input mode to Term, then the 2 M signal input to Balanced.

```
Setup:Measure

  Measuring mode   :In-service
  Input mode       :Term
  2M signal input  :Unbalanced
     CRC-4         :ON
     Channels      :30
     Signalling    :ON
  Program start    :ON  [10-01 10:00:00]
```

Fig.7-12 Setup:Measure Screen

4 Set the resistance attenuator value to 0 dB, wait 2 seconds, then check that all Alarm/Error LEDs on the panel are unlit.

5 Set the Input mode to Mon on the Setup:Measure screen. Set the resistance attenuator value to 19 dB, and 21 dB. Each time, wait 2 seconds then check that all Alarm/Error LEDs on the panel are unlit.

6 Replace the coaxial cable with a cable of 10 m or less, then repeat steps 4 and 5.

7.4.7 Bipolar input level (Unbalanced)

(1) Test specifications

- Frequency 2.048 Mb/s
  8.448 Mb/s
  34.368 Mb/s

- Input level

Nominal value	2.37 ± 0.237 $V_{0\text{-}P}$ (2 M, 8 M)
	1 ± 0.1 $V_{0\text{-}P}$ (34 M)
Cable loss	0 to 6 dB (at 1 MHz for 2 M, at 4.2 MHz for 8 M)
	0 to 12 dB (at 17 MHz)
Addition gain	20 dB

(2) Setup

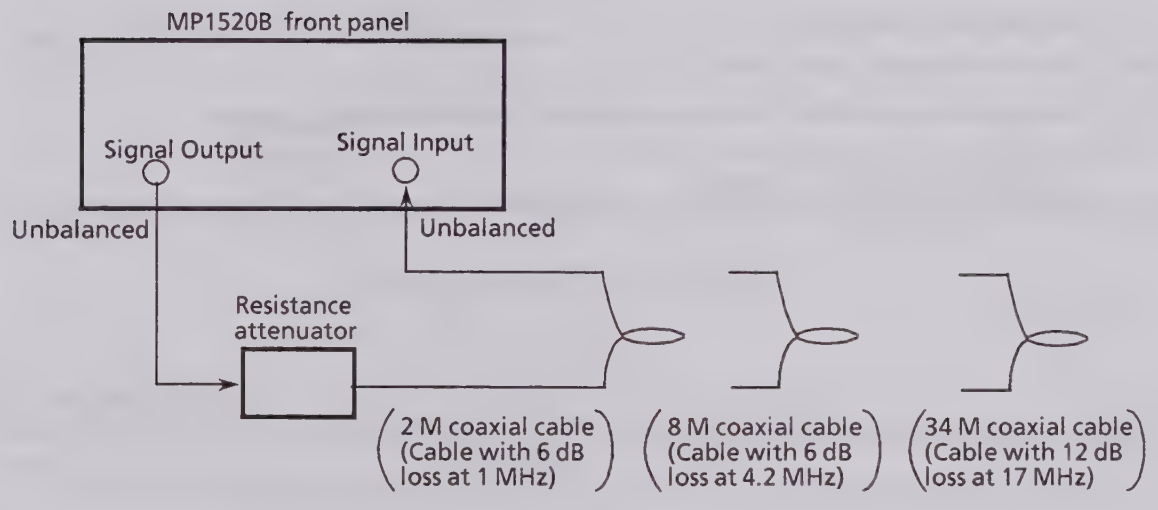

MP1520B front panel
Signal Output
Signal Input
Unbalanced
Unbalanced
Resistance attenuator
2 M coaxial cable (Cable with 6 dB loss at 1 MHz)
8 M coaxial cable (Cable with 6 dB loss at 4.2 MHz)
34 M coaxial cable (Cable with 12 dB loss at 17 MHz)

Fig. 7-13 Bipolar Input Level Test (Unbalanced)

(3) Test procedure

Step	Procedure
1	Connect the MP1520B as shown in Fig.7-13. Use the 2 M coaxial cable.
2	Set the bit rate to 2 Mb/s on the Condtn screen.
3	On the Setup:Measure screen, check that the Input mode has been set to Term, and the 2 M signal input to Unbalanced.
4	Set the resistance attenuator value to 0 dB, wait 2 seconds, then check that all Alarm/Error LEDs on the panel are unlit.
5	Set the Input mode to Mon on the Set:Measure screen. Set the resistance attenuator value to 19 dB, 20 dB, and 21 dB. Each time, wait 2 seconds then check that all Alarm/Error LEDs on the panel are unlit.
6	Replace the coaxial cable with a cable of 10 m or less, then repeat steps 4 and 5.
7	Replace the coaxial cable with the 8 M one.
8	Set the bit rate to 8 Mb/s. Set the Input mode to Term on the Measure screen.
9	Repeat steps 4 through 6.
10	Replace the coaxial cable with the 34 M one.
11	Set the bit rate to 34 Mb/s. Set the Input mode to Term on the Measure screen.
12	Repeat steps 4 through 6.

7.4.8 CMI input level

(1) Test specifications

- Frequency 139.264 Mb/s
- Input level

Nominal value	$1 \pm 0.1\ V_{P-P}$
Cable loss	0 to 12 dB (at 70 MHz)
Addition gain	20 dB

(2) Setup

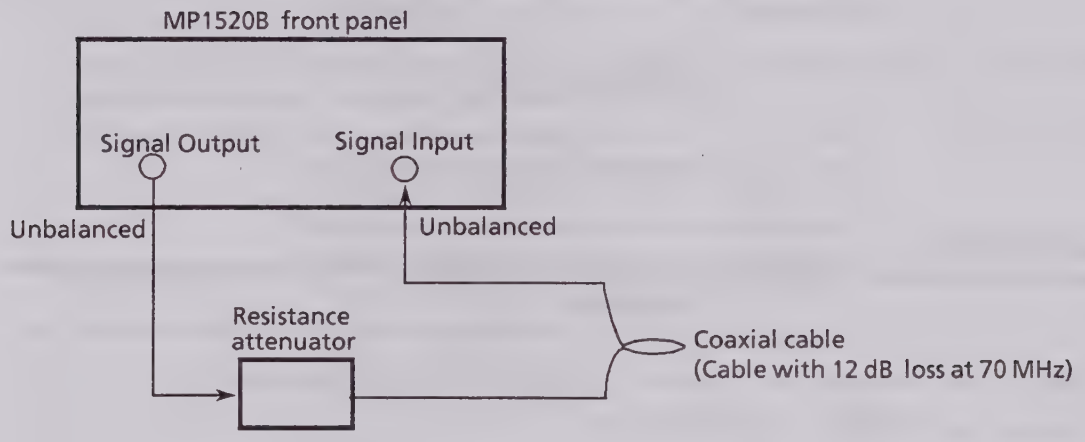


Fig. 7-14 CMI Input Level Test

(3) Test procedure

Step	Procedure
1	Connect the MP1520B as shown in Fig.7-14.
2	Check that the bit rate has been set to 139 Mb/s on the Condth screen.
3	Set the Input mode to Term on the Setup:Measure screen.
4	Set the resistance attenuator value to 0 dB, wait 2 seconds, then check that all Alarm/Error LEDs on the panel are unlit.
5	Set the Input mode to Mon on the Setup:Measure screen. Set the resistance attenuator value to 19 dB, 20 dB, and 21 dB. Each time, wait 2 seconds then check that all Alarm/Error LEDs on the panel are unlit.
6	Replace the coaxial cable with a cable of 10 m or less, then repeat steps 5 and 6.

7.4.9 Frequency measurement

(1) Test specifications

- Accuracy ±4 ppm

(2) Setup

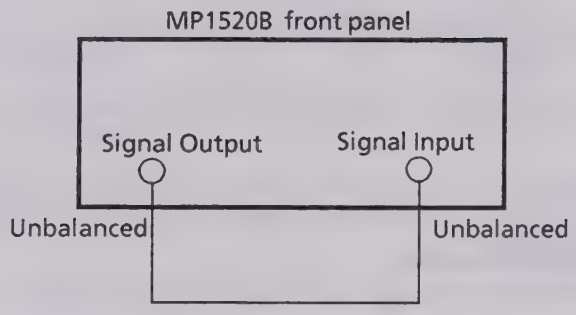


Fig. 7-15 Frequency Measurement Test

(3) Test procedure

Step	Procedure
1	Measure the transmit signal bit rate at 139 Mb/s as explained in paragraph 7.4.1.
2	Connect the MP1520B as shown in Fig.7-15.
3	Check that the bit rate has been set to 139 Mb/s on the Condth screen.
4	Measure the receive signal frequency on the result screen.

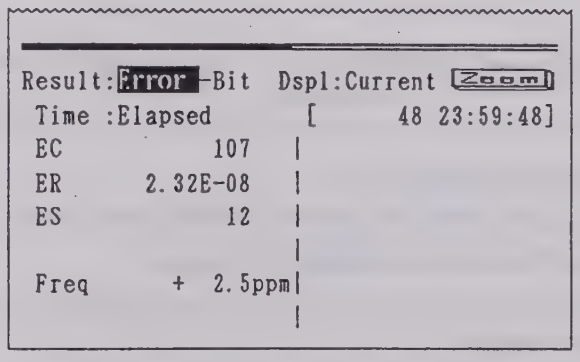


Fig. 7-16 Result Screen (Frequency)

5	Check that |Transmit signal bit rate error (Deviation) − Receive signal frequency error (Deviation)| ≦ 4 ppm is satisfied.

7.4.10 LED, buzzer, and clock

(1) Test specifications

Shown in the following procedure

(2) Setup

No setup is required.

(3) Test procedure

Step	Procedure

1 Turn on the MP1520B power switch.

2 Check that all LEDs light and the buzzer sounds for approximately 1 second. These operations are forced to occur for approximately 1 second.

3 Set Time to Date & Time on the Result screen.

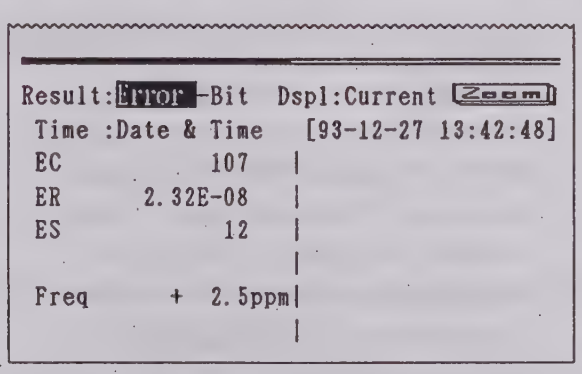


Fig. 7-17 Result screen (Date & Time)

4 In this state turn the MP1520B power switch off for aproximately 5 seconds then turn the power on again. Check that the clock time has advanced by 5 seconds.

7.4.11 Printer

(1) Test specifications

Shown in the following procedure

(2) Setup

No setup is required.

(3) Test procedure

Step	Procedure
1	Turn the power switch on while holding down the Copy key. (Hold down the Copy key for about one second after turning the power on.)
2	Check that pattern shown in Fig.7-18 is printed out.
3	Check that the print operation ends after approximately 3 seconds, and that the print key then goes off.

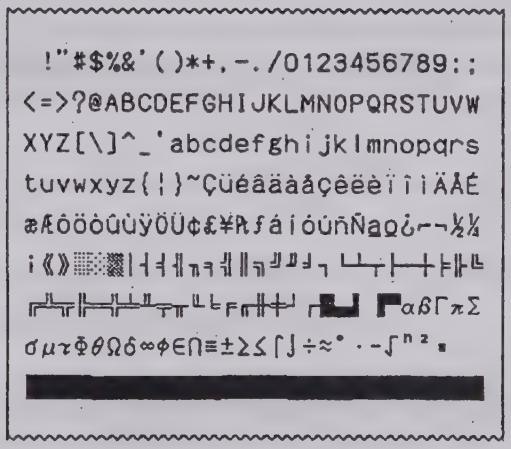


Fig. 7-18 Printer Test

7.4.12 External Clock Input

(1) Test specifications

- Frequency
  2.048 MHz ±100 ppm
  8.448 MHz ±100 ppm
  34.368 MHz ±100 ppm
  139.264 MHz ±100 ppm
- Level 0.8 to 1.6 $V_{0\text{-}P}$
- Pulse shape Sinewave

(2) Setup

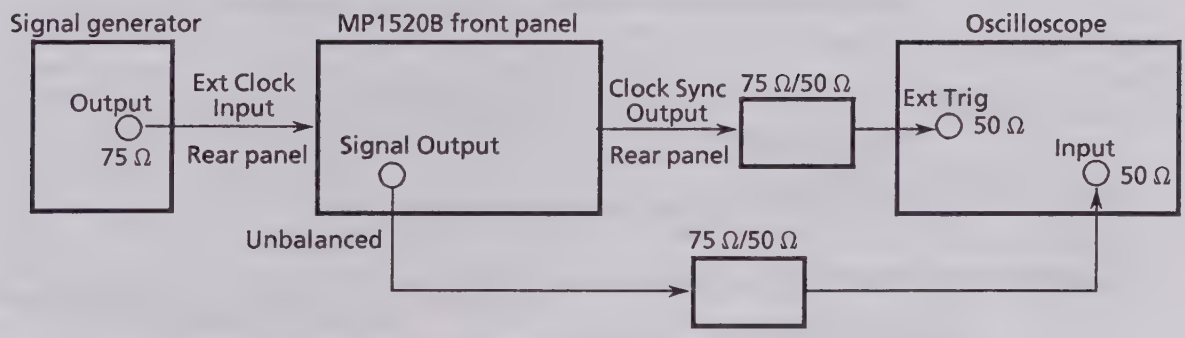


Fig. 7-19 External Clock Input Test

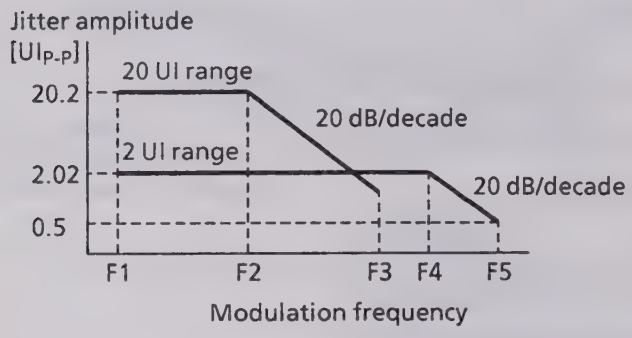
(3) Test procedure

Step	Procedure
1	Connect the MP1520B as shown in Fig.7-19. Set frequency and level of the signal generator to 2.048 MHz and 1 $V_{P\text{-}P}$, respectively.
2	Set the bit rate to Ext 2M on the Condtn screen.
3	Check that the pulse shape is within the pulse mask shown in Fig. 7-3.
4	Change the bit rate to Ext 8M, Ext 34M and Ext 139M and check that waveforms satisfy Figs. 7-5, 7-6 and 7-8.

7.4.13 Jitter Generation

(1) Test specifications

- Frequency: 2.048 MHz, 8.448 MHz, 34.368 MHz, 139.264 MHz
- Jitter modulation signal: 2 Hz to 4 MHz
- External modulation signal sensitivity: 2 $UI_{p\text{-}p}$/1V (2 UI range), 20 $UI_{p\text{-}p}$/1V (20 UI range)
- Jitter generation



Frequency	F1 Hz	F2 Hz	F3 (Hz)	F4 (Hz)	F5 (Hz)
2 M	2	1 k	20 k	27.5 k	110 k
8 M	2	1 k	20 k	105 k	420 k
34 M	2	5 k	100 k	250 k	1 M
139 M	2	5 k	100 k	1 M	1 M

F2 to F5: Typical values

- Accuracy: ±5% ±0.05 $UI_{p\text{-}p}$/1 kHz (2 UI range)
  ±5% ±0.3 $UI_{p\text{-}p}$/1 kHz (20 UI range)
  Frequency error (reference: 1 kHz)
  2 UI range: ±2% (F1 to F4), ±5% (F4 to F5)
  20 UI range: ±2% (F1 to F2), ±5% (F2 to F3)

(2) Setup

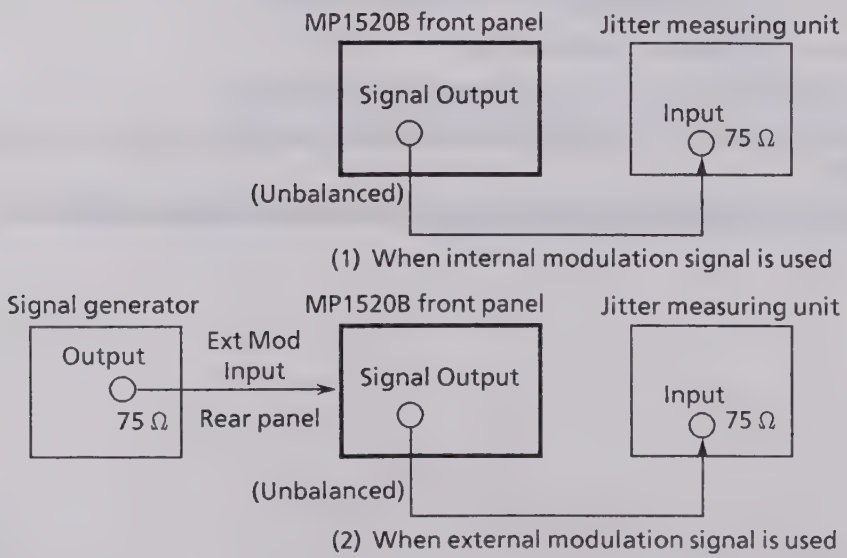


Fig. 7-20 Jitter Generation Test

(3) Test procedure

Step	Procedure

1 First, check using the internal modulation signal. Connect as shown in Fig. 7-20 (1).

2 Set the bit rate to 2 Mb/s on the Condtn screen.

3 Set Jitter to Manual on the Jitter screen.

4 Set settings on the Jitter screen as listed in Table 7-2. Check that the error at each setting and measured by the jitter measuring unit is within the specified value. Check settings Nos. 1, 2 and 3.

Table 7-2 Settings on Jitter Screen (2 Mb/s)

No.	Range	Freq.	Tx Jitter Amplitude	Error (Note)
1	20 UI	1 kHz	10.00 UI_{P-P}	$<$0.6 UI_{P-P}
2	2 UI	1 kHz	1.000 UI_{P-P}	$<$0.06 UI_{P-P}
3	2 UI	100 kHz	0.500 UI_{P-P}	$<$0.045 UI_{P-P}

5 Change the bit rate to 8, 34 and 139 Mb/s on the Condtn screen. Check the error for each setting according to Table 7-3.

Table 7-3 Settings on Jitter Screen (8 M, 34 M, 139 Mb/s)

Bit rate	No.	Range	Freq.	Tx Jitter Amplitude	Error (Note)
8 Mb/s	1	20 UI	1 kHz	10.00 UI_{P-P}	$<$0.6 UI_{P-P}
	2	2 UI	1 kHz	1.000 UI_{P-P}	$<$0.06 UI_{P-P}
	3	2 UI	400 kHz	0.500 UI_{P-P}	$<$0.05 UI_{P-P}
34 Mb/s	1	20 UI	1 kHz	10.00 UI_{P-P}	$<$0.6 UI_{P-P}
	2	2 UI	1 kHz	1.000 UI_{P-P}	$<$0.06 UI_{P-P}
	3	2 UI	800 kHz	0.500 UI_{P-P}	$<$0.05 UI_{P-P}
139 Mb/s	1	20 UI	1 kHz	10.00 UI_{P-P}	$<$0.6 UI_{P-P}
	2	2 UI	1 kHz	1.000 UI_{P-P}	$<$0.06 UI_{P-P}
	3	2 UI	3.5 MHz	0.500 UI_{P-P}	$<$0.085 UI_{P-P}

6 Next, check using the external modulation signal. Connect as shown in Fig. 7-20 (2). Set the signal generator to 1 kHz and 0.5 V.

7 Set the bit rate to 2 Mb/s on the Condtn screen.

8 Set the Mode to Ext ($>=$10 Hz) and the Range to 2 UI on the Jitter screen.

9 Check that the Tx jitter amplitude value indicated is between 0.8 and 1.2 UI_{P-P}, under the above settings.

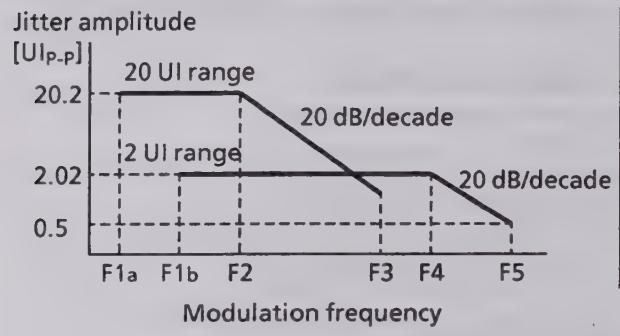
Note: *The error actually used is a value obtained by adding the error measured by the jitter measuring unit to the value above.*

7.4.14 Jitter Measurment

(1) Test specifications

- Frequency
  2.048 MHz
  8.448 MHz
  34.368 MHz
  139.264 MHz

- Jitter measurement



Frequency	F1a (Hz)	F2b (Hz)	F2 (Hz)	F3 (Hz)	F4 (Hz)	F3 (Hz)
2 M	10	20	1 k	20 k	25 k	100 k
8 M	10	20	1 k	20 k	100 k	400 k
34 M	50	100	5 k	100 k	200 k	800 k
139 M	100	200	5 k	100 k	875 k	3.5 M

F2 to F5: Typical values

- Accuracy
  ±5% ±0.01 UI_{p-p} ± X/1 kHz (2 UI range)
  ±5% ±0.1 UI_{p-p} ± X/1 kHz (20 UI range)
  X
  2 UI range: 0.025 UI_{p-p}/2, 8 M, 0.055 UI_{p-p}/34 M, 0.085 UI_{p-p}/139 M
  20 UI range: 0.12 UI_{p-p}/2, 8, 34 M, 0.2 UI_{p-p}/139 M

  Frequency error (reference: 1 kHz)
  2 Hz to 20 Hz: ±5%
  20 Hz to 300 kHz: ±2%
  300 kHz to 1 MHz: ±3%
  1 MHz to 3 MHz: ±5%
  3 MHz to 4 MHz: ±10%

- Demod output
  1 V/2 UI_{p-p} (2 UI range)
  1 V/20 UI_{p-p} (20 UI range)

(2) Setup

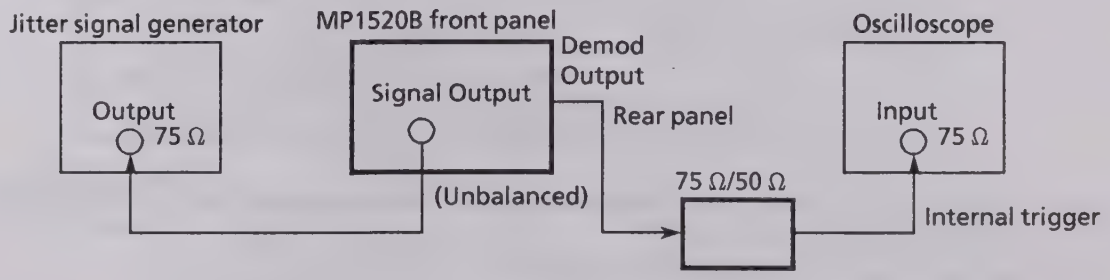


Fig. 7-21 Jitter Measurement Test

(3) Test procedure

Step	Procedure

1 Connect as shown in Fig. 7-21.

2 Set the bit rate to 2 Mb/s on the Condtn screen.

3 Set Jitter to Manual, Meas to Intv 10.2s, Range to Auto and Filter to OFF on the Jitter screen.

4 Set settings of the jitter generator as listed in Table 7-4. Check that the error at each setting and indicated at Rx Jitter Amplitude column of the unit is within the specified value. Check settings Nos. 1, 2 and 3.

Table 7-4 Jitter Generator Setting (2 Mb/s)

No.	Freq.	Jitter Amplitude	Others	Error (Note)
1	1 kHz	10.00 UI_{P-P}	Pattern: PRBS2^{15}-1 Code: HDB3	<0.6 UI_{P-P}
2	1 kHz	1.000 UI_{P-P}		<0.06 UI_{P-P}
3	100 kHz	0.500 UI_{P-P}		<0.045 UI_{P-P}

5 Check that the Demod output of Nos. 1 and 2 is between 0.4 and 0.6 V and that of No. 3 is between 0.2 and 0.3 V.

6 Change the bit rate to 8, 34 and 139 Mb/s on the Condtn screen. Check the error for each setting according to Table 7-5. The Demod output is the same as those specified in 5 above.

Table 7-5 Jitter Generator Setting (8 M, 34 M, 139 Mb/s)

Bit rate	No.	Freq.	Jitter Amplitude	Others	Error (Note)
8 Mb/s	1	1 kHz	10.00 UI_{P-P}	Pattern: PRBS2^{15}-1 Code: HDB3	<0.72 UI_{P-P}
	2	1 kHz	1.000 UI_{P-P}		<0.095 UI_{P-P}
	3	400 kHz	0.500 UI_{P-P}		<0.085 UI_{P-P}
34 Mb/s	1	1 kHz	10.00 UI_{P-P}	Pattern: PRBS2^{23}-1 Code: HDB3	<0.72 UI_{P-P}
	2	1 kHz	1.000 UI_{P-P}		<0.095 UI_{P-P}
	3	800 kHz	0.500 UI_{P-P}		<0.085 UI_{P-P}
139 Mb/s	1	1 kHz	10.00 UI_{P-P}	Pattern: PRBS2^{23}-1 Code: CMI	<0.7 UI_{P-P}
	2	1 kHz	1.000 UI_{P-P}		<0.014 UI_{P-P}
	3	3.5 MHz	0.500 UI_{P-P}		<0.165 UI_{P-P}

Note: *The error actually used is a value obtained by adding the error of the jitter signal generator to the value above.*

7.4.15 Hit Measurement

(1) Test specifications

- Threshold 2 UI range: 0.05 to 1.0 UI_{O-P}/Step 0.01 UI_{O-P}
  20 UI range: 0.5 to 10.0 UI_{O-P}/Step 0.1 UI_{O-P}

(2) Setup

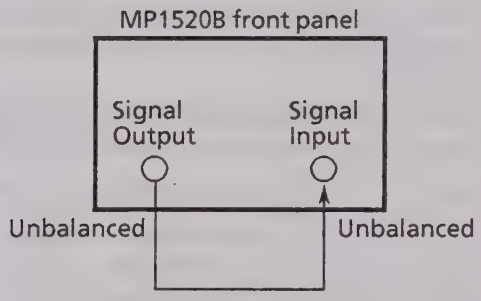


Fig.7-22 Hit Measurement Test

(3) Test procedure

Step	Procedure
1	Connect as shown in Fig. 7-22.
2	Set the Bit rate to 139 Mb/s and the Mode to Repeat [1secs] on the condtn screen.
3	Set the Jitter to Manual on the Jitter screen. As for the Tx, set Mode to Internal, Range to 2 UI, Freq to 1 kHz and Jitter Amplitude to 1.8 UI_{P-P}. As for the Rx, set Range to 2 UI, Filter to OFF and Threshold to 0.5 UI_{O-P}.
4	Check that the measured Hit count is between 1980 and 2020.

SECTION 8
STORAGE AND TRANSPORTATION

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8.3.1 Repacking 8-4

8.3.2 Transportation 8-4

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8.1 Cleaning Cabinet

Always turn the MP1520B Power switch Off and disconnect the power plug from the ac power inlet before cleaning the cabinet.

To clean the external cabinet:

- Use a soft, dry cloth for wiping off.
- Use a cloth moistened with diluted neutral cleaning liquid if the instrument is very dirty or before long-term storage.

  After insuring that the cabinet has been thoroughly dried, use a soft, dry cloth for wiping off.
- If loose screws are found, tighten them with the appropriate tools.

CAUTION

Never use benzene, thinner, or alcohol to clean the external cabinet; it may damage the coating, or cause deformation or discoloration.

8.2 Storage Precautions

This paragraph describes the precautions to take for long-term storage of the MP1520B PDH Analyzer.

8.2.1 Precautions before storage

(1) Before storage, wipe dust, finger-marks, and other dirt off the MP1520B.

(2) Avoid storing the MP1520B where:

1) It may be exposed to direct sunlight or high dust levels.
2) It may be exposed to high humidity.
3) It may be exposed to active gases.
4) It may be exposed to extreme temperatures ($< -20°C$ or $> 70°C$) or high humidity ($< 20\%$ or $\geqq 90\%$).

8.2.2 Recommended storage precautions

The recommended storage conditions are as follows:

- Temperature ..... 0 to 30°C
- Humidity ..... 40% to 75%
- Stable temperature and humidity over 24-hour period

8.3 Repacking and Transportation

The following precautions should be taken if the MP1520B must be returned to Anritsu Corporation for servicing.

8.3.1 Repacking

Use the original packing materials. If the MP1520B is packed in other materials, observe the following packing procedure:

(1) Attach the protect cover to this instrument front panel.

(2) Wrap the MP1520B in a plastic sheet or similar material.

(3) Use a cardboard, wooden box, or aluminum case which allows shock-absorbent material to be inserted on all sides of the equipment.

(4) Use enough shock-absorbent material to protect the MP1520B from shock during transportation and to prevent it from moving in the container.

(5) Secure the container with packing straps, adhesive tape or bands.

8.3.2 Transportation

Do not subject the MP1520B to severe vibration during transport. It should be transported under the storage conditions recommended in paragraph 8.2.

APPENDIXES

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APPENDIX B SELF DIAGNOSTIC ERROR CODES B-1

APPENDIX C ALARM DETECTING CONDITIONS C-1

(Blank)

APPENDIX A
INITIAL VALUES

Table A Initial Values (1/3)

Screen	Screen label	Function	Initial value
Condtn	Condtn	Transmitter or receiver setting selection	Tx&Rx
	Bit rate	Bit rate and offset (*1)	139 Mb/s + 0 ppm
	Patt	Pattern type	PRBS23
	Frame	Frame added or not added	ON
	Alarm	Alarm addition type	OFF
	Error	Error addition type	OFF
	Mode	Measurement mode and measurement time	Repeat [1sec]
	MUX/DEMUX	Final Tributary signal and route settings (*2)	OFF
	Jitt	With/without jitter generation (*5)	ON
Result	Result	Measured result display selection	Error-Bit
	Dspl	Current/Last display	Current
		Zoom setting	Zoom
	Time	Measurement time display setting	Elapsed
Analysis: Trace Text	Error format	Error display format setting	EC
	Print	Text printing range setting	Dspl
Analysis: Trace Graph	Interval	Interval setting	1sec
	Error	Display error setting	Bit -EC
	Print	Bar graph printing range setting	Dspl
		Display alarm setting	All, LOS, Patt
Analysis: Distribution	Error	Display error setting	Bit -EC
Setup: Measure	Measuring mode	Service state setting	Out-of-service
	2 M signal input	Input terminal setting	Unbalanced
	CRC-4	CRC-4 setting	ON
	Channels	Channel count setting	30
	Signalling	Signalling setting	ON
	Timed start	Measurement start time setting	OFF

*1 This function is valid when the frequency offset option is installed.
*2 This function is valid when the MUX or DEMUX option is installed.
*3 These functions are valid when the GPIB board is installed.
*4 These functions are valid when the RS-232C board is installed.
*5 These functions are valid when the jitter generation/measurement option is installed

Table A Initial Values (2/3)

Screen	Screen label	Function	Initial value
Setup: Performance	Type	Performance measurement type setting	OFF
Setup: Print	Intermediate data	Intermediate data printing setting	OFF
	Measuring condition	Measuring condition printing setting	ON
	Error occurrence	Error printing setting	ON
	Format	Error printing format setting	EC
	Threshold	Error threshold value setting	OFF
	Paper saving	Paper saving setting	OFF
	Alarm occurrence	Print/don't print on alarm occurrence	ON
	Measured data	Measured result printing item setting	All
System	Buzzer	Buzzer setting	OFF
	GPIB Usage	GPIB operation mode setting (*3)	Control
	Address	GPIB address setting (*3)	1
	RS-232C Usage	RS-232C operation format setting (*4)	Control
	Speed	RS-232C transfer rate setting (*4)	9600 bps
	Parity	RS-232C parity setting (*4)	None
	Character length	RS-232C transfer character length setting (*4)	8 bits
	Stop bit length	RS-232C stop bit length setting (*4)	2 bits
	Flow control	RS-232C flow control setting (*4)	Read/Busy

*1 This function is valid when the frequency offset option is installed.
*2 This function is valid when the MUX or DEMUX option is installed.
*3 These functions are valid when the GPIB board is installed.
*4 These functions are valid when the RS-232C board is installed.
*5 These functions are valid when the jitter generation/measurement option is installed

Table A Initial Values (3/3)

Screen	Screen label	Function	Initial value
Jitter: Manual (*5)	Tx Mode	Jitter modulation signal selection	Internal
	Tx Range	Jitter amplitude range setting	20 UI
	Tx Freq	Jitter modulation signal frequency setting	10.0 Hz
	Tx Amptd	Jitter amplitude setting	Fine
	Rx Meas mode	Jitter measurement interval setting	Intv 10.2 s
	Rx Range	Jitter amplitude range setting	20 UI
	Rx Filter	Jitter measurement filter setting	OFF
	Rx Threshold	Threshold setting for Hit measurement	1.00
	Dspl	Current/Last display setting	Current
		Zoom setting	Zoom
	Time	Measurement time display setting	Elapsed
Jitter: (*5) Sweep mask	Table	Table selection	R
	Point	Number of points setting	10
Jitter: Transfer (*5)	Table	Table selection	R
	Point	Number of points setting	10
	Mode	Measurement/calibration selection	Meas
	Dspl	Display content setting	Meas (Graph)
	Scale	Scale setting	10 dB
Jitter: Jitt/Freq (*5)	Min freq	Minimum frequency setting	−50
	Max freq	Maximum frequency setting	+50
	Step	Frequency variable step setting	10
	Interval	Jitter measurement time/point setting	1
	Filter	Jitter measurement filter setting	OFF
	Scale	Scale setting	2.0 UI

*1 This function is valid when the frequency offset option is installed.
*2 This function is valid when the MUX or DEMUX option is installed.
*3 These functions are valid when the GPIB board is installed.
*4 These functions are valid when the RS-232C board is installed.
*5 These functions are valid when the jitter generation/measurement option is installed

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APPENDIX B
SELF DIAGNOSTIC ERROR CODES

If an error occurs while selftest is being executed from the Selftest screen, the corresponding error code is displayed where Test Result is displayed on the screen.

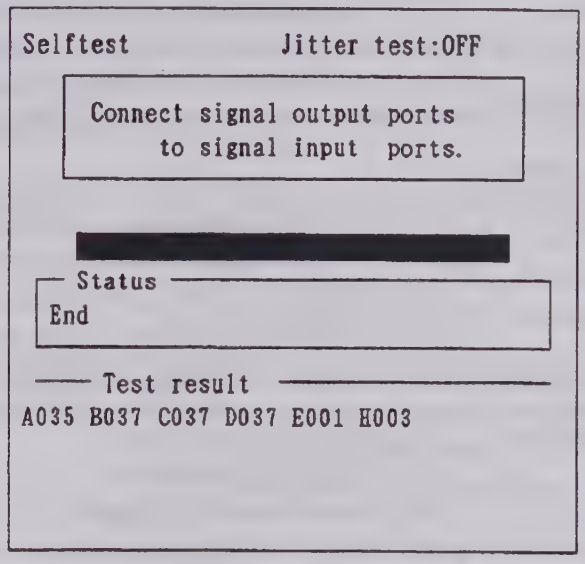

Fig. B-1 Display at Self Diagnostic Error

The error code displayed on the screen consists of one alphabetic character indicating a self-diagnosis item and a three-digit octal number. The errors indicated by each bit are listed in Table B.

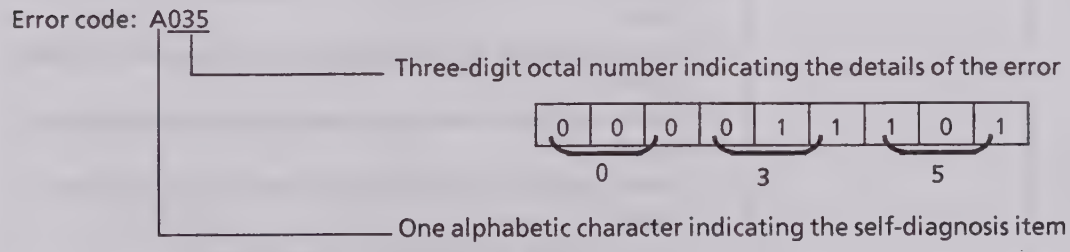
Error code: A035
Three-digit octal number indicating the details of the error
0 0 0 0 1 1 1 0 1
0
3
5
One alphabetic character indicating the self-diagnosis item

Fig. B-2 Error Code Structure

Table B Self-Diagnosis Items and Details of Errors (1/2)

Alphabetic character	Self-diagnosis item	Bit	Details of error
A	139 Mb/s signal	b0	A bit rate error is ±10 ppm or more.
B	34 Mb/s signal	b1	Faulty sending or receiving of pseudorandom pattern $2^{11}-1$.
C	8 Mb/s signal	b2	Faulty sending or receiving of pseudorandom pattern $2^{15}-1$.
D	2 Mb/s signal (unbalanced terminal)	b3	Faulty sending or receiving of pseudorandom pattern $2^{23}-1$.
		b4	Faulty sending or receiving of word pattern.
E	2 Mb/s signal (balanced terminal)	b5	Faulty sending or receiving of framed signal.
F	Frequency offset option	b0	A 139 Mb/s signal error is ±5 ppm or more.
		b1	A 34 Mb/s signal error is ±5 ppm or more.
		b2	An 8Mb/s signal error is ±5 ppm or more.
		b3	A 2 Mb/s signal error is ±5 ppm or more.
G	MUX/DEMUX option	b0	Faulty MUX or DEMUX option.
H	Error addition/error detection	b0	Faulty bit error addition.
		b1	Faulty bit error detection.
		b2	Faulty frame error detection.
		b3	Faulty CRC-4 error detection.
		b4	Faulty CMI code error addition or detection.
		b5	Faulty bipolar code error addition or detection.
I	Alarm addition/alarm detection (1)	b0	Faulty AIS addition or detection of the 139 Mb/s signal
		b1	Faulty AIS addition or detection of the 34 Mb/s signal.
		b2	Faulty AIS addition or detection of the 8 Mb/s signal.
		b3	Faulty AIS addition or detection of the 2 Mb/s signal.
		b4	Faulty adding or detecting of remote alarm to the 139 Mb/s signal.
		b5	Faulty adding or detecting of remote alarm to the 34 Mb/s signal.
		b6	Faulty adding or detecting of remote alarm to the 8 Mb/s signal.
		b7	Faulty adding or detecting of remote alarm to the 2 Mb/s signal.
		b8	Faulty adding of multiframe remote alarm.
J	Alarm addition/alarm detection (2)	b0	Faulty signal-off detection.
		b1	Faulty detecting of frame loss of the 139 Mb/s signal.
		b2	Faulty detecting of frame loss of the 34 Mb/s signal.
		b3	Faulty detecting of frame loss of the 8 Mb/s signal.
		b4	Faulty detecting of frame loss of the 2 Mb/s signal.
		b5	Faulty multiframe loss detection.
		b6	Faulty pattern sync loss detection.
		b7	Faulty FAS alarm addition or detection.

Table B Self-Diagnosis Items and Details of Errors (2/2)

Alphabetic character	Self-diagnosis item	Bit	Details of error
K	Jitter modulation value/measured value	b0	Jitter modulation value or measured value at 139 Mb/s is abnormal.
		b1	Jitter modulation value or measured value at 34 Mb/s is abnormal.
		b2	Jitter modulation value or measured value at 8 Mb/s is abnormal.
		b3	Jitter modulation value or measured value at 2 Mb/s is abnormal.
L	Jitter tolerance	b0	Jitter tolerance at 139 Mb/s is abnormal.
		b1	Jitter tolerance at 34 Mb/s is abnormal.
		b2	Jitter tolerance at 8 Mb/s is abnormal.
		b3	Jitter tolerance at 2 Mb/s is abnormal.
M	Jitter measurement frequency range	b0	Measurement frequency range at 139 Mb/s is abnormal.
		b1	Measurement frequency range at 34 Mb/s is abnormal.
		b2	Measurement frequency range at 8 Mb/s is abnormal.
		b3	Measurement frequency range at 2 Mb/s is abnormal.
N	Hit measurement	b0	Hit measurement at 139 Mb/s is abnormal.
		b1	Hit measurement at 34 Mb/s is abnormal.
		b2	Hit measurement at 8 Mb/s is abnormal.
		b3	Hit measurement at 2 Mb/s is abnormal.

(Blank)

APPENDIX C
ALARM DETECTING CONDITIONS

(1) Loss of signal: At signal-off

(2) Loss of frame alignment (2M): G.706

Detection: Alignment signals of three consecutive frames contain errors.

Release: The error is released as follows:

1. The normal frame alignment signal is received.
2. Bit 2 of Time slot 0 of the frame without the frame alignment signal is set to 1.
3. The normal frame alignment signal is received.

(3) Loss of frame alignment (8M): G.742

Detection: Alignment signals of four consecutive frames contain errors.

Release: Alignment signals of three consecutive frames are normal.

(4) Loss of frame alignment (34M): G.751

Detection: Alignment signals of four consecutive frames contain errors.

Release: Alignment signals of three consecutive frames are normal.

(5) Loss of frame alignment (139M): G.751

Detection: Alignment signals of four consecutive frames contain errors.

Release: Alignment signals of three consecutive frames are normal.

(6) AIS (2M): G.797, O.162

Detection: Two consecutive diframes containing two or less zeros per diframe (one diframe: 512 bits) are detected.

Release: Two consecutive diframes containing three or more zeros per diframe are detected.

(7) AIS (8M): G.797

Detection: Two consecutive frames containing four or less zeros per frame are detected.

Release: Two consecutive frames containing five or more zeros per frame are detected.

(8) AIS (34M): G.797

Detection: Two consecutive frames containing four or less zeros per one frame are detected.

Release: Two consecutive frames containing five or more zeros per frame are detected.

(9) AIS (139M): G.797

Detection: Two consecutive frames containing five or less zeros per frame are detected.

Release: Two consecutive frames containing six or more zeros per frame are detected.

(10) Loss of multiframe alignment (2M CRC-4):

Detection: Two consecutive CRC-4 multiframe alignment signals contain errors.

Release: Normal CRC-4 multiframe alignment signals are received one by one after the frame in (2) is synchronized.

(11) Loss of multiframe alignment (2M Signaling): G.732

Detection: Two consecutive signaling multiframe alignment signals contain errors.

Release: Normal signaling multiframe alignment signals are received one by one after the frame in (2) is synchronized.

(12) Remote alarm (2M):

Detection: Bit 3 of TS0 of four consecutive frames without FAS contain errors.

Release: Bit 3 of TS0 of two consecutive frames without FAS do not contain errors.

(13) Remote alarm (2M MF):

Detection: Bit 6 of TS16 of three consecutive Frame 0's contain errors.

Release: Bit 6 of TS16 of two consecutive Frame 0's do not contain errors.

(14) Remote alarm (8M):

Detection: Remote alarm bits of four consecutive frames contain errors.

Release: Remote alarm bits of two consecutive frames do not contain errors.

(15) Remote alarm (34M):

Detection: Remote alarm bits of four consecutive frames contain errors.

Release: Remote alarm bits of two consecutive frames do not contain errors.

(16) Remote alarm (139M):

Detection: Remote alarm bits of four consecutive frames contain errors.

Release: Remote alarm bits of two consecutive frames do not contain errors.

(17) Pattern Sync Loss:

Detection: (1) 64 k PRBS
Errors of 10^3 bits or more occur for clocks of 10^4 bits.

(2) 64 k Word
Errors of 5×10^2 bits occur for clocks of 10^4 bits.

(3) 2M, 8M, 34M, 139M PRBS
Errors of 10^4 bits occur for clocks of 10^5.

(4) 2M, 8M, 34M, 139M Word
Errors of 5×10^3 bits occur for clocks of 10^5 bits.

Release: About 30 bits without errors are detected.

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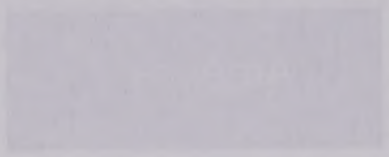

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